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RADIUM IN SEARCH OF A PARENT.

Radium may be considered as one of the infants of the family of chemical elements, young so far as our acquaintance with it is concerned, and young, it is said, even in actual years; for while until recently we have been content to accept the chemical elements as we found them and to assume, so far as we could say, at least, they had always existed since the creation, radium, it is said, is a baby element only a few thousand years old. It is an active infant, however, and its addition to the chemical series has caused a much greater stir in scientific society than did any other element, or, at least, any added since chemical science was well established.

Ever since this new member of the family was recognized, it has attracted to itself a great deal of attention because of certain peculiarities which it possesses. In some of these it does not stand alone, as there are certain other elements sharing them. Certain ones, like uranium, are old acquaintances; others, such as actinium, are more recent acquisitions; but, in the popular mind, at least, these but little understood marvels are inseparably associated with radium.

One of the peculiarities of this element—if such it be—which, from a scientific standpoint, may be the most important characteristic, is its appearance in places where it apparently did not exist before—that is, its production or generation from some other element. In other words, this new addition to the family of chemical elements insists on having a parent, and is not satisfied even with its astonishing properties, but must have a family tree; and certain of its admirers are now busily engaged in tracing back the line of descent and in establishing the relationship between the newcomer and several other elements.

It is generally considered that radium, and possibly actinium, are ultimately descended from uranium, and until recently it was thought that the immediate predecessor or parent of radium was actinium, the latter descending, more or less directly, from uranium. The relationship has, however, never been definitely established, and a more recent investigation by Dr. E. Rutherford, a brief account of which is given in *Nature* (London) for June 6, seems to show that actinium is not the parent of radium; that although it may represent one generation, the true parent has not yet been identified nor named, although it is apparently possible to separate it from actinium and uranium. The new element, it is expected, will soon be described and properly christened.

This particular phase of the study of radioactive elements is of absorbing interest, but unfortunately, or otherwise, we have as yet discovered no method of controlling the changes or trans-

mutations. Experiments are therefore slow, and have but little attraction for those who like to produce effects; but there are others who apparently are determined to pursue this matter to the end, and it may be that eventually we may be required to adopt a new chemical chart which will arrange the elements in generations, and not merely group those together which inherit certain family characteristics.

METER MAINTENANCE IN SMALL CENTRAL STATIONS.

The inspection, testing and repairing of consumers' meters is one of the most important features of central station work, and practically all large companies have taken great pains to perfect their organization in this line of activity. The larger the number of consumers, the more important it becomes that small errors in individual meters shall not be multiplied to a loss of many hundreds of dollars a year of legitimate revenue. The accuracy of the ordinary electric service meter is little short of remarkable, considering the demands upon it for light and partial load registration, and it is interesting to note that the larger meters used in the main generating plants are in the class of precision instruments when properly treated. At a recent meeting of the American Institute of Electrical Engineers in Boston, Mr. L. L. Elden, of the Boston Edison Company, pointed out that the accuracy of the large meters used in his company's generating plants is ordinarily close to 100 per cent for all commercial service.

Unfavorable location and ill-use of consumers' meters opens the way to endless complaints in addition to the possible loss of revenue which properly belongs to the central station company. It is unfortunate that the meter question as a whole is viewed with so much disfavor by consumers, and any one who has ever acted as arbitrator between a central station and its customers on the subject of meter readings and the resulting bills knows how difficult it is to convince the public that a meter is accurate, even within twenty-five or thirty per cent. Even where a state board tests consumers' meters for a nominal fee, returning the money in case the meter is too fast, as in Massachusetts, the public can be brought only with the greatest difficulty to accept an adverse decision. Hence the great importance of doing everything possible to disarm suspicion on the part of consumers. Even a small central station can afford to install a meter in a glass case in its main offices near the cashier's window and by suitable wiring and switches connect it with different sizes and number of lamps, so that the public can note, by the increase or decrease in the speed of the disc's rotation, the exact correspondence with the load connected in circuit. Such an arrangement, properly labelled, is worth more to a central station which has to meet hostile criticism than dozens of newspaper squibs about the company's good intentions.

The cost of regularly testing meters is often regarded as prohibitive by small stations, with the result that the consumer's installation is left to its own devices until such date as the meter begins to run much too fast for the consumer's satisfaction. It would seem doubtful if more than a year should be allowed to pass without a test of each consumer's meter, even in a small system. The moral effect of such a test is no small part of its value, but most of all it is essential that the company should have the benefit of accurate readings. The errors of individual meters in small systems are proportionately of greater consequence than in large stations. The meter stands at the end of a long chain of energy transformation in the modern central station system, and every kilowatt-hour which it fails to register is multiplied by the reciprocal of the transmission and generating plant efficiency in its effect upon the fuel bill and wages account per unit of output. There is no question that some of the money expended by small plants to secure higher economy of current generation may be profitably diverted to the better care of meters installed in their consumers' premises. Meter tests are easily made with the portable apparatus now available, and there is reason to believe that the importance of this work, even in small systems, will constantly be better appreciated in the future.

THE RUBBER OUTLOOK.

The position occupied by rubber in the industrial world is unique, for as yet no satisfactory substitute for its most important uses has been found, and were it possible to reduce its cost, either by improving the methods of harvesting and cultivation, or by increasing the output, its application would be greatly extended. The situation, on the whole, is said to be encouraging. The latest review of the field was made in a paper read in the latter part of April last by Mr. Herbert Wright, before the London Society of Arts. This paper dealt with the subject mainly with reference to Great Britain's tropical colonies, but did not neglect to refer briefly, at least, to other sources. It was shown that the world's consumption of rubber for 1906 was over 62,000 tons. This represents a steady increase. The price, also, was the highest reached during the last seven years. It was pointed out that at the present time we are almost absolutely dependent upon indigenous trees in certain tropical forests, but, fortunately, we should begin to reap the benefits of the planting that has been done. Indeed, in certain sections the output of cultivated rubber has become important.

In the discussion of the paper one speaker, while not wishing to minimize the importance of rubber planting, called attention to the possibility of the production of artificial rubber, drew an analogy to the history of the cinchona industry, in which a synthetic compound had taken the place of the natural product.

Another speaker, Mr. Fritz Zorn, took issue with this view. Although he was glad a note of warning had been struck, he was of the opinion that the cultivation of rubber is now mainly a question of organization. It is known that the plants can be grown successfully, and will produce freely. The problem, therefore, reduces to one of economical harvesting and placing the product on the market. There was one point which, however, should not be overlooked. As yet but little has been said about the probabilities of damage to the crops due to disease, particularly of plants growing in new localities. With respect to the artificial production of rubber, he thought that the danger

there was comparatively slight. There are two difficulties to be overcome. The first is the discovery of the means for making a satisfactory substitute; the second is the problem of doing so at a cost which will enable the artificial rubber to compete with the natural product. The price of Para rubber last year ranged from $1.25 to $1.40 a pound, but these figures are not those with which the artificial product would have to compete. To be successful, he thought that the cost of production of the latter would have to be, roughly, about twenty-five cents a pound, and unless it could be brought below this, the planter had nothing to fear.

There are several features entering into this industry which did not enter into the cinchona industry. This drug was wanted for a particular purpose, and its use has not been extended by the reduction in price. With rubber the case is entirely otherwise, for the use of this material to-day is limited only by its cost. If it could be made cheaper, its use would correspondingly increase, and this, of course, would tend to keep up the price. As indicating the many applications which would not be unlikely should rubber become cheap, he said that it would furnish a most excellent material for street paving, and mentioned that a certain section at Euston station, London, had been paved with a rubber composition eighteen years ago, and up to the present time has worn only about five-eighths of an inch. This would seem to demonstrate that, compared with wood, asphalt and pavings of that description, rubber would be much cheaper in the long run, because of its enormous durability. He said that while the present consumption is 65,000 tons a year, with the price at about $1.25, that a reduction in price to $1 a pound would double the consumption, and a further reduction to seventy-five cents a pound would quadruple it. Therefore, even though the cost could be reduced to twenty-five cents, there was not much fear of over-production for many years to come. It seems probable that rubber will take a very much important place among engineering materials than is to-day accorded it, perhaps becoming not much less important than copper.

THE PROPERTIES OF ELECTRONS.

In taking upon himself the task of preparing and presenting before the American Institute of Electrical Engineers a résumé of the work which has been done in that new branch of physical science which deals with the electrons, Dr. Samuel Sheldon has done an acceptable service. Although the newer ideas developed from the study of these apparently sub-atomic particles are referred to not infrequently in discussions before the Institute, no paper has been devoted especially to this subject, and it is thus highly proper that for his presidential address Dr. Sheldon should select this topic, which, moreover, is one in which he, himself, is particularly interested, and to which he has devoted a good deal of time and study.

It is, of course, true that the ideas grouped about the electrons are not universally accepted, and there are some who object to using them in an endeavor to explain many puzzling phenomena. Yet it should be remembered that these ideas are merely put forward as a general hypothesis, which is serving an exceedingly useful purpose in directing investigations and in bringing to light new facts. A great many of these new facts are in accord with ideas set forth before the facts themselves were observed, and it is also true that not a few new facts are at variance with the hypothesis. This is, of course, to be expected, because of our present incomplete knowledge, which forces us to treat as a more or less simple structure a body which is believed to be exceedingly complex. Hence it has been necessary to make new assumptions in order to explain the new phenomena. We are as yet groping with difficulty in the dimly lighted field of science, and should gratefully accept every new observation which tends to give us a better idea of what is in the field; and we should not reject that aid to this work which is furnished by a working hypothesis.

The presidential address consisted of a summary of the work which has been done up to the present time, avoiding, as far as possible, abstruse analytical arguments, but stating the deductions drawn and the reasons leading to them. There are many paths in this field, each apparently leading in a direction of its own, but happily for the electron theory, the idea of a sub-atomic particle or point of strain in the ether possessing a negative charge of electricity, or producing that effect which we attribute to such a charge can at the present time, at least, be usefully employed for explaining why what happens does happen.

Possibly at this time the division of this study of the most immediate practical importance is that dealing with the production of light, but, unfortunately, none of the conceptions so far offered for this phenomenon can be considered entirely satisfactory. Light is supposed to be produced by violent vibration of the atoms of the incandescent matter and by the electrons or corpuscles as well, but by just what mechanical process can not be said. It may be that the luminous rays are due merely to the vibration of the electron alone, but some reason must be found for explaining the spectral lines of all elements. Connected with this phase of the subject is the study of selective radiation, by taking advantage of which it was hoped that a better transformation efficiency might be obtained for our illuminants. Still another interesting phase is luminescence, or the production of light by some other cause than the mere absorption of heat. It is now believed that this process is far more efficient in the production of light than incandescence, or the mere raising of a body to the luminous condition by increasing its temperature. Luminescence may be produced in bodies in three ways, termed, respectively, chemico, photo and electro-luminescence. It is remarkable that this property is possessed by certain minute organisms, and it has been suggested that the secret of a more efficient lamp might be found in this direction. Unfortunately, the intrinsic brilliancy of these luminescent organisms is very low. Some means must be found for multiplying it greatly before any practical benefit may be expected.

It is pleasing to find Dr. Sheldon has been able to treat this rather difficult subject in a simple manner, and also that he has brought it up to the present time and alluded to all of the most recent work, so that this address may be commended to all interested in the progress of science.

ANNUAL CONVENTION OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

NIAGARA FALLS, N. Y., JUNE 25-29.
FIRST DAY'S SESSION.

(By Telegraph to the Electrical Review)

NIAGARA FALLS, N. Y., JUNE 25.—The twenty-fourth annual convention of the American Institute of Electrical Engineers was called to order by President Samuel Sheldon at 10 o'clock Tuesday morning in the Cataract Hotel. The president introduced Mayor A. C. Douglass, of Niagara Falls, saying that he had been identified with nearly all of the power developments carried out in the last fifteen years. Mr. Douglass gave an interesting sketch of some of the difficult work which he had encountered, and described a project for illuminating the falls by means of two large batteries of projectors, placed on the Canadian side, which will produce beautiful effects, and which will probably be put in service by August 15. Mayor Douglass then extended the freedom of the city to the Institute and assured the members of their welcome.

President Sheldon, on behalf of the Institute, thanked Mayor Douglass for his courtesy and opened the serious work by the delivery of his presidential address, entitled "The Properties of Electrons."

The author explains concisely the modern conception of the electron and traces briefly the work of J. J. Thomson and others, by means of which the charge upon the electron and its mass were determined. From this it is possible to estimate the size of the electron. Thomson's speculations respecting the nature of atoms, upon the supposition that the atom consists of a sphere of uniform positive electrification in which are contained a number of moving electrons, are explained, and what information we have respecting positive and negative ions is cited. The author then proceeds to a discussion of the application of these ideas to certain physical processes, such as the metallic conduction of electricity, metallic conduction of heat, contact electromotive force, thermo-electromotive force, induced electromotive force and the Hall effect, and shows how each of these can easily be explained in accordance with the conception of the electron as already discussed.

The number of free electrons per cubic centimetre of metal is very large, being of the order of a billion billions. The mean free path of an electron scarcely exceeds one-millionth of a centimetre in any case. The number per cubic centimetre, and the length of free path, are different for different metals. It has long been known that, with some exceptions, the heat and electrical conductivities of pure metals, when at proper temperatures, depending upon the metal, bear a constant ratio to each other. No satisfactory explanation of this has been given except that which assumes that both electricity and heat are conveyed by electrons, one under the influence of electromotive force and the other under the influence of temperature. Contact and thermal electromotive forces may be set up at any point where the balance between electrons tending to move in opposite directions is upset. This may be due either to an excess of ions in one metal, or to a difference in velocity, or to an excess of velocity due to temperature. If the electron, in the process of metallic conduction, is supposed to move as a charged body, it will, of course, be affected by transverse magnetic fields, and thus account for the Hall and other similar effects. Solid dielectrics properly contain some free electrons, although the number per unit volume is small. Free atomic atoms are probably absent, since conduction through their mediation would result in the transport of matter. The molecular magnetic theory of magnetic induction in iron can by analogy be directly applied to solid dielectrics consisting of groups of molecules which ordinarily are not oriented, but become so under the application of an electric force.

Attention is also called to the effect of luminescence. If the nature of a body changes because of the light which it radiates, and it does not continue indefinitely to yield the same radiation, although its temperature be kept constant, the process is termed luminescence. There are other ways in which this may occur, termed, respectively, chemico, photo and electroluminescence. If the intensity of radiation of a body within any region of wave-lengths is greater than that of a black body of the same temperature, luminescence must be present. Although change in the character of the material as a consequence of its yielding luminescent radiation may not be capable of detection by chemical analysis, the atomic and molecular systems are nevertheless undergoing constant changes due to the loss or gain of electrons. The entrance of an electron into a system, or its ejection, must, without doubt, occasion complex harmonic disturbances of many or all the electrons in the system. If the luminescent radiation be confined chiefly to wave-lengths of the visible spectrum, the luminous efficiency of the body becomes high.

The author concludes that, although much is known concerning the size and mass of the electron, its electric and magnetic effects when in motion, and its radiation effects during acceleration, little more is known concerning its structure than, as put by Larmor, "It is the intrinsic strain-form alone that constitutes the electron, and it is a fundamental postulate that the form can move from one portion to another of the stagnant ether somewhat after the manner of a knot slipping along a cord."

Following this, Dr. A. E. Kennelly's paper was read by title, the author being absent.

H. W. Fisher read a paper on the heating of copper wires. This was discussed by Dr. C. P. Steinmetz and H. G. Stott, who approved of the general idea but cautioned against putting too much dependence on the proposed tests.

Morgan Brooks, in a paper entitled "Interaction of Synchronous Machines," described a new graphical diagram for studying such machines. E. J. Berg and C. P. Steinmetz said in the discussion that no diagram based upon ideal conditions would give close results in practice, due to factors which could not be completely allowed for.

The morning session was then adjourned.

During the afternoon a trolley trip was taken down the Niagara gorge.

The second session was held Tuesday evening at 8.30. Chairman T. C. Martin, of the building committee, made another appeal to the membership to raise the remainder of the money for the Institute's share of the ground for the Engineering Societies Building.

The three papers on lightning protection—by E. E. F. Creighton, on "Protective Apparatus Engineering"; by P. H. Thomas, on "Practical Testing of Commercial Lightning Arresters," and by N. J. Neall, on "A Proposed Lightning-Arrester Test"—were read and discussed together.

Dr. Steinmetz pointed out the great difficulty of getting up any test, satisfactory from all points of view.

Messrs. Thomas and Neall did not approve of extending our definitions without a greater need, and W. S. Lee asked for a test that any competent engineer could apply on the ground.

L. Cohen, being absent, his paper on "Inductive Disturbances in Telephone Lines" was read by title and the session was adjourned. W. H. B.

The New Power-House of the Jackson Electric Railway, Light and Power Company, of Jackson, Miss.

By L. S. Thurston.

THE new power-house of the Jackson Electric Railway, Light and Power Company, of Jackson, Miss., which has recently been put into service, is situated on the eastern edge of the city on a bluff overlooking the Pearl river bottoms,

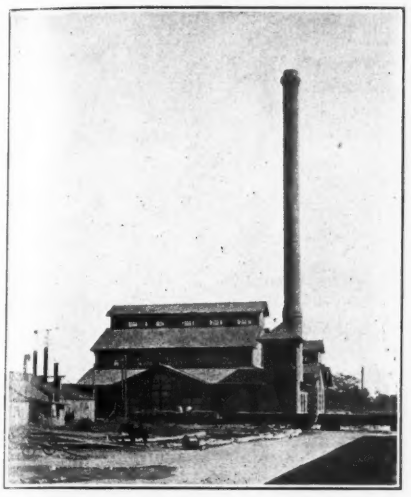


FIG. 1.—GENERAL VIEW OF PLANT, JACKSON ELECTRIC RAILWAY, LIGHT AND POWER COMPANY, OF JACKSON, MISS.

and well above any recorded high-water mark.

The old power-house and car barns, built in 1898, adjoining the north end of the new plant, supplied all of the power for the street railway system, arc lights and most of the commercial lighting and power. But, owing to a great increase in the size of the city during the last few years, the capacity of the plant became entirely insufficient to meet the demands and the new one was designed.

The actual work of construction of the new building was begun in February, 1906, and the plant put into full commercial service in December of the same year.

The building, erected by the Leonard Martin Construction Company, of Chicago, is strictly fireproof. The walls are of pressed brick and self-supporting. The floor is concrete, reinforced with steel netting, and carried on I-beams supported by concrete piers. This forms a basement having a depth of eight feet, except in the boiler room, where the floor is laid on cinders on the ground. The entire building is covered by a red-tile roof on a steel framework. A general view of the exterior is shown in Fig. 1.

In the engine room, all the apparatus, with the exception of the boiler-feed pumps, the oil pumps for the lubricating system, and the step-bearing pumps for the turbines, is located on the main floor.

The switchboard, consisting of twenty blue Vermont marble panels, each thirty-two inches wide by ninety inches high by two inches thick, is supported by a pipe framework, thirteen feet from the west wall.

All 125-volt and 600-volt direct-current switches are mounted on the face of their respective panels, while all the 2,300-volt alternating-current oil switches are carried on an auxiliary pipe framework, six feet behind the board, and operated by hand through a system of bell cranks, rods and levers.

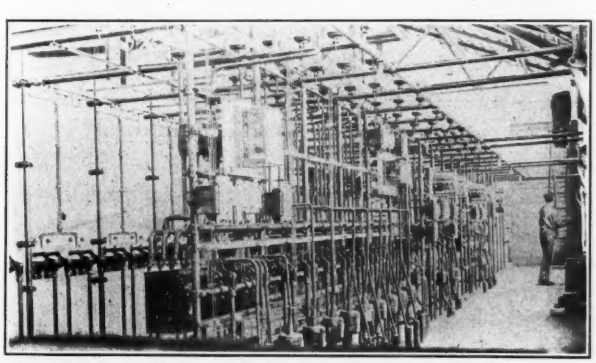


FIG. 3.—REAR VIEW OF DIRECT-CURRENT SWITCHBOARD.

The main alternating-current 2,300-volt busses are mounted on top of the framework and are divided into two sets, one for lighting and one for power.

Figs. 2 and 3 show the front and rear view of the switchboard respectively. In the latter may be seen the recording watt-meters, of which there are eight, *viz.*, one for the total 600-volt, direct-current output; one for the two three-phase, 2,300-volt induction motors driving the railway generators; one for the 220-volt induction motor driving the exciter; one for each

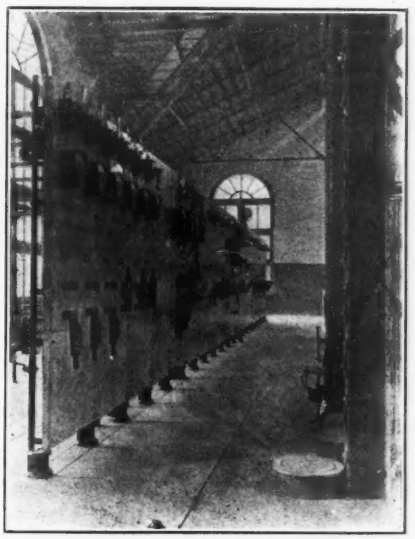


FIG. 2.—FRONT VIEW OF DIRECT-CURRENT SWITCHBOARD.

500-kilowatt turbo-alternator; one for each of the two single-phase lighting circuits, and one for the total three-phase 2,300-volt power circuit. Five blank panels are left for future equipment.

All wires and cables are carried in con-

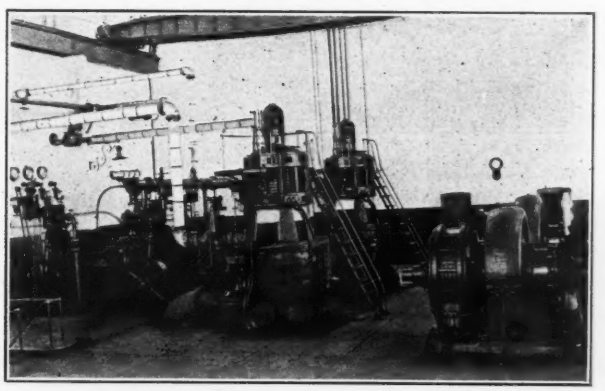


FIG. 4.—TURBO-GENERATORS AND EXCITERS.

duit under the main floor, the various outgoing circuits being carried to a wire tower in the southwest corner of the building and from there distributed on pole lines throughout the city.

Two 500-kilowatt Curtis turbine-driven alternators (Fig. 4), running at 1,800

revolutions per minute and delivering three-phase current at 2,300 volts and sixty cycles, are at present installed.

A twenty-five-kilowatt, 125-volt Curtis turbo-exciter furnishes excitation current for starting in case both alternators should suffer a complete shut-down, while for continuous operation a twenty-five-kilowatt, 125-volt exciter is used, direct-connected to a thirty-five-horse-power, three-phase, 220-volt, sixty-cycle induction motor running at 900 revolutions per minute.

turbines, was furnished and installed by the General Electric Company under the supervision of the author. All station wiring, however, including the connection of the various machines to the switchboard, was done by the local company.

The condensing equipment, supplied by the Alberger Condenser Company, consists of duplicate sets of circulating and dry vacuum pumps, and one barometric condenser of 3,000-horse-power capacity. The circulating pumps (Fig. 5) are of

bricating system of the turbines. These are shown in Fig. 7.

A hand operated traveling crane of fifteen tons capacity, built by the Northern Engineering Company, spans the engine room with the exception of the bay in which the switchboard is located.

An eighteen-inch brick wall separates the engine room from the boiler room. Mounted on the engine-room side of this wall are duplicate steam and water gauges, so that the engineer in charge may note

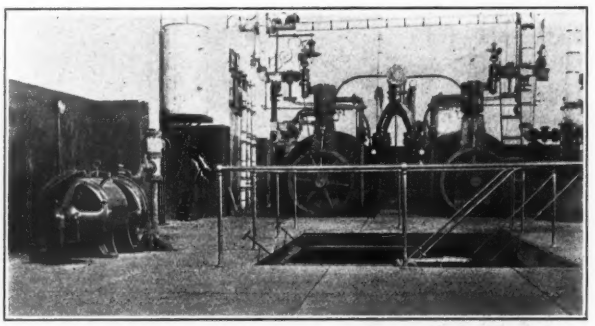


Fig. 5.—Circulating Pumps.

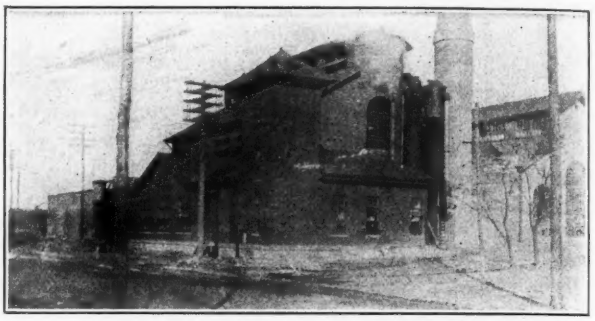


Fig. 6.—Outside View Showing Condenser.

Power for the street railway is supplied by two 250-kilowatt generators, compounded 525 to 575 volts. Each machine is direct-connected to a 310-horse-power, three-phase, sixty-cycle, 2,300-volt induction motor. These generators likewise furnish current for operating several 550-volt direct-current motors installed in various parts of the city.

the centrifugal type, direct-connected to simple vertical engines, twelve by twelve inches, running at 100 to 150 revolutions per minute. The dry vacuum pumps are of the regular Alberger design, eight by sixteen by twelve inches. The pumps are behind the turbines, as shown in the accompanying illustrations, while the condenser is located out of doors and just outside of the south wall of the engine room, as shown in Fig. 6.

at all times the condition of the boilers. The exhaust steam from the auxiliaries may be passed either directly to the atmosphere, or through a National enclosed feed-water heater situated in the southeast corner of the engine room (see Fig. 8).

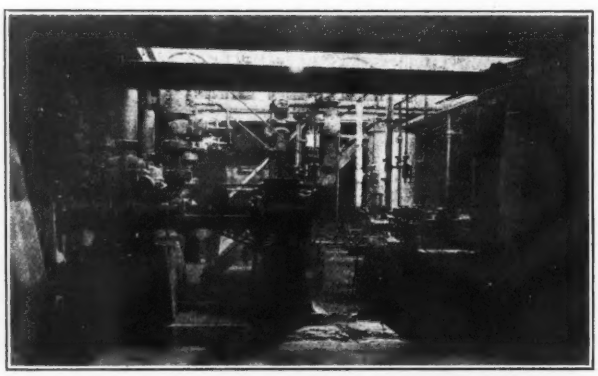


Fig. 7.—Pump Equipment in Basement.

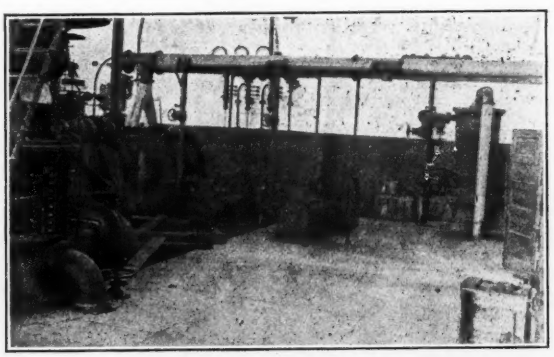


Fig. 8.—Piping and Feed-Water Heater.

Eleven cars, operating over about fourteen miles of track, constitute the street railway system.

At present 225 series enclosed, 7.5-ampere arc lamps are used to illuminate the principal streets. These are divided into three circuits, each being fed by a 100-light, constant-current, air-cooled transformer. These transformers take current directly from one phase of the lighting busses, and each has its own panel, switches and recording wattmeter.

The electrical equipment, including the

In the basement, and immediately under a large opening in the engine-room floor, are located two Blake boiler-feed pumps, each ten by six by twelve inches; two Worthington high-pressure pumps, each four and one-half by one and five-eighths by four inches, which supply water for the turbine step-bearings; and two Blake oil pumps, two by one and one-quarter by two and three-quarters inches, for the lu-

A view in the boiler room is shown in Fig. 9. The present equipment consists of three Stirling boilers rated at 350 horse-power each and built to operate at 225 pounds gauge pressure. Each boiler is fitted with a superheater and furnishes steam to the turbines at 175 pounds and about 150 degrees Fahrenheit superheat. The gases from the fires pass, either directly or through a Green economizer, to a Weber reinforced concrete chimney, 208 feet high. All firing and removal of ashes is done by hand.

To the east of and adjoining the boiler room, but separated from it by rolling

steel doors, are the coal bins, three in number. They are built of concrete and are each thirty-three feet long by twenty-five feet wide by fourteen feet deep, the bottoms being flush with the boiler-room floor. The tops are level with the ground

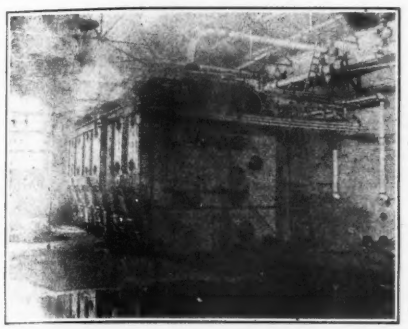


FIG. 9.—BOILER ROOM.

at the south end and the whole is protected from the weather by a red-tile roof on a steel framework corresponding to the main roof of the plant.

A railroad track, carried on steel girders which span the coal bins, connects with a spur of the Alabama & Vicksburg Railroad, only a few yards distant, so that coal in carload lots may be unloaded practically in front of the furnace doors.

Water for the boilers, condensing system, etc., is taken from a reservoir, 100 feet long by thirty feet wide by ten feet deep, built of concrete and located east of and adjoining the coal bins. This reservoir is supplied from a well, twenty feet in diameter by twenty feet deep, flowing 500 gallons per minute, located at the foot of the hill behind the plant. The water is forced up by two centrifugal Worthington pumps, having each a capacity of 750 gallons per minute. These pumps are direct-connected to three-phase, sixty-cycle, 220-volt, fifteen-horse-power vertical induction motors, installed in a pump house built directly over the well and above high-water mark.

The water from the condenser hot-well can discharge by gravity directly back into the reservoir if not too warm, or over a wide raceway down the hill to the well, where it is sufficiently cooled and is pumped up to the reservoir again.

Ample room is left in both engine and boiler rooms for more than doubling the present capacity of the plant.

The chief engineer has his private office adjoining the engine room. Separate lavatories, containing wash-basins, a porcelain-lined bathtub and a toilet, are provided for the white and colored employés.

Fig. 10 shows the general wiring diagram of the plant.

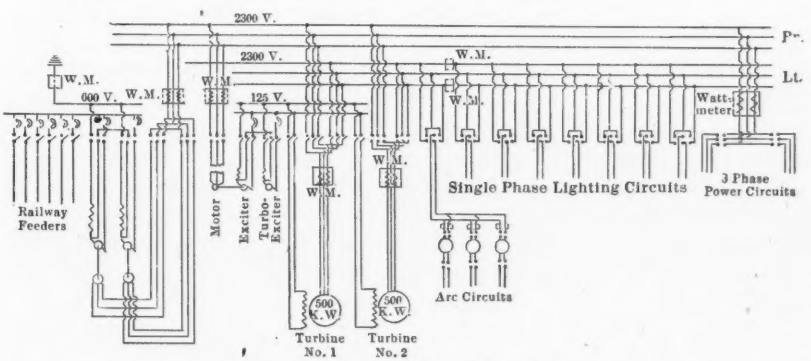


FIG. 10.—GENERAL WIRING DIAGRAM.

The Public Utilities Commission and the New York Electrical Society.

At the annual meeting of the New York Electrical Society, held in New York city, on June 10, the following resolutions were passed:

WHEREAS, The legislature of New York state has enacted the Public Utilities Bill; providing for the appointment by the governor of two commissions, consisting of five men each, and

WHEREAS, These two commissions are to have general direction and charge of the electric lighting, electric railway, gas, steam railway, and other public utilities including practically all the large engineering enterprises within the state, and

WHEREAS, Many of the questions to be settled by said commissions are technical in character, the responsibility for the decision of which should properly be borne by commissioners and not by hired experts,

Therefore, Be It Resolved, That in the opinion of this society, the engineering profession should be given representation on each of the state commissions by the appointment of two or more commissioners who shall be technically trained men with business ability, and

Further Resolved, That the secretary be and hereby is instructed to send copy of this resolution to the governor of the state, the Honorable Charles E. Hughes.

Illuminating Engineering Society.

A meeting of the New York section of the Illuminating Engineering Society was held at the Edison Auditorium, 44 West Twenty-seventh street, New York city, on the evening of Friday, June 14. A paper presented by George C. Keech, of the Chicago section, entitled "Industrial Plant Illumination," was read in abstract by A. S. Hubbard.

The artificial illumination of industrial plants is of the greatest importance, as it must be depended upon for from ten to twenty per cent of the working hours of average plants not running nights or overtime. Where every successful operation is a source of profit and every error a loss to both employer and employé, the artificial illumination should be sufficient and lamps properly placed so that work can be done as well as by daylight. There are few plants which make a practice of cleaning and renewing incandescent lamps, and the attention given to arc lamps would be less if regular trimming were not necessary. The foreman of a shop has told the author that the product of his department, operating during night hours, was increased about fifteen per cent by a thorough overhauling of his shop lighting. Even a smaller percentage of increase would justify most plants in giving the matter of their illumination more attention.

It is common practice, together with some large units for general illumination, to furnish each workman with a single sixteen-candle-power incandescent lamp which, when new and at the average height from his work, usually gives him a fair amount of light. Dirt, oil, sawdust, etc., soon reduce his illumination one-half, but it is not expected that the quality or quantity of his work should be reduced in the same proportion. In a particular instance, where the author made measurements, a lamp hanging one foot one inch above the face-plate of a drill and seven inches from the centre gave 3.7 foot-candles at this point. A new, clean lamp was placed in the same socket and gave 5.6 foot-candles at the same spot. Again, the dirtiest lamp in the shop was substituted and measured only 1.55 foot-candles. These lamps with even the cheapest shades or reflectors would produce better results and catch less dirt.

A study has been made of the woodworking shop of a Chicago factory with four different systems of lighting. The floor is seventy-five feet by ninety-seven feet, and the net area after deducting

stairways, etc., is 7,044 square feet. This floor was originally lighted by five five-ampere arc lamps and forty-five sixteen-candle-power individual incandescents. No test of this system was made and it was fairly satisfactory, although the energy was high, as will be noted in the following table.

TABLE I.

	Mercury Vapor Lamps.	Metallized Filament Clusters.	New Arcs.	5 Old Arcs 45 Incand.
Height of ceiling	10′ 10″	10′ 10″	10′ 10″	
Height of lamps	9′ 10″	7′ 10″	8′ 5″	
Height of test plane	3′ 4″	3′ 4″	3′ 4″	
Height of lamps above test plane	6′ 6″	4′ 10″	5′ 1″	
Total watts	3,080	3,500	5,280	5,558
Square feet illuminated	7,044	7,044	7,044	7,044
Number of lamps	16	70*	16	
Average watts per lamp	192.5	50	330	
Average watts per outlet	192.5	125	330	
Average square feet per lamp	440	100	440	
Number of test stations	26	26	26	
Watts per square foot	.431	.497	.749	.787
Square feet per watt	2.28	2.01	1.33	
Average foot-candles	2.91	1.56	2.28	
Foot-candles per kilowatt	.944	.446	.431	
Kilowatts per foot-candle	1.059	2.243	2.316	
Foot-candles per watt per square foot	6.66	3.14	3.04	
Watts per square foot per foot-candle	.151	.318	.329	
Annual cost as installed	$220.48	$212.68	$278.34	
Annual cost for three foot-candles	226.96	409.06	366.24	

*Grouped into 21 two-light and 7 four-light clusters.

One step toward reducing the energy and still attempting to give sufficient general and detailed illumination was to install seventy fifty-watt metallized-filament lamps in two and four-light clusters with fifteen-inch porcelain-lined reflectors. A still further reduction in power with greater intensity was effected by the installation of sixteen mercury vapor lamps with twenty-one-inch tubes and regulation reflectors. In order to have every possible system represented a set of sixteen three-ampere arc lamps was installed, each within a few feet of a vapor lamp.

Each system was measured separately and readings were taken at a distance of three feet four inches from the floor, which corresponded with the height of most of the machines and benches.

The results are given in Table I, which also includes some data on the original installation, as well as the figures of the firm conducting the test on the yearly maintenance of each system, based on their costs and experience and including interest on investment, cost of current and renewals for the number of lamp-hours burned in this department. The yearly cost as shown in the first row is for the illumination as tested and in the second row for an intensity of three foot-candles, which is deemed necessary for this class of work.

An illumination test was also made of the linotype room of the Chicago *Tribune*, using arc lamps and another test a short time later with the mercury vapor lamps which succeeded them, and which were hung in the same locations. Readings in both tests were taken at the same stations and at a plane four feet from the floor, at which average height, it was observed, reading of copy was done as operators passed about the room. Each machine has of necessity its individual incandescent lamp. These were not considered in the test, which refers to general illumination only. The readings of the two systems at each of the stations were very close together.

The vapor lamps were of twenty-one-inch tube-length, provided with reflectors and hung thirteen feet from the floor, and the arc lamps had dense opal outer globes, which accounts for the good diffusion. These lamps were hung so that the height of the arc averaged ten feet from the floor. The results of the test are given in Table II.

The walls and ceiling were dark terra-cotta and probably added nothing in reflection.

TABLE II.

	Arc Lamps.	Vapor Lamps.
Height of ceiling	14′ 10″	14′ 0″
Height of lamps	10′ 0″	13′ 0″
Height of test plane	4′ 0″	4′ 0″
Height of lamp above test plane	6′ 0″	9′ 0″
Total watts	2,310	1,155
Square feet illuminated	4,095	4,095
Number of test stations	12	12
Number of lamps	6	6
Average square feet per lamp	682.5	682.5
Watts per square foot	.56	.28
Square feet per watt	1.77	3.54
Average watts per lamp	385	192.5
Average foot-candles	1.485	1.679
Foot-candles per watt per square foot	2.65	5.99
Watts per square foot per foot-candle	.377	.167

In Table III are given the results of tests made of the drafting room of the Illinois Steel Company, Chicago. The lighting of this room was laid out by the writer in the spring of 1906, with the intention of giving an average intensity of eleven foot-candles and as even a distribution as possible. Also to give the draftsmen as nearly as possible the same direction of light as they would receive from the windows.

This was accomplished by hanging type K vapor lamps of forty-five-inch tube-lengths in front of each window at a distance of one foot. Four lamps down the centre finish the distribution.

The plane of illumination was taken at forty-two inches from the floor which is the height of the table tops, and the stations are located in each case directly upon a drawing. The foot-candles averaged 9.7 or thirteen per cent less than proposed, which is easily accounted for in the accumulation of dust on the tubes and reflectors which were not cleaned for the occasion; in fact, they had not been touched since they were installed nine months before. The building is not far distant from the many smoking chimneys of the plant.

It may seem strange that this accumulation of dust would have such an effect on the illumination from the lamps, but a test made directly underneath one lamp at a distance of five feet nine inches showed six foot-candles, and after the tube and reflector had been wiped off the reading was 6.7 foot-candles or an increase of nearly twelve per cent.

As the writer could find no drafting room in Chicago of as high intensity with any other system of lighting he compared it with the Duane street drafting room of the New York Edison company lighted by arc lamps with concentric diffusers, and described by Edward A. Norman at the March meetings of the New York and Chicago sections of the Illuminating Engineering Society. In Table III the results of the two tests are compared.

TABLE III.

	Illinois Steel	N. Y. Edison.
Height of ceiling to girders	13′ 6″	13′ 6″
Height of lamps	11′ 6″	11′ 0″
Height of test plane	3′ 6″	3′ 9½″
Height of lamps above test plane	8′ 0″	7′ 3″
Total watts	7,700	12,173
Total square ft. illuminated	3,914	1,519
Number of lamps	20	17
Average watts per lamp	385	715
Average square feet per lamp	195.7	89.3
Number test stations	23	20
Watts per square foot	1.97	8.07
Square feet per watt	.508	.124
Average foot-candles	9.7	13.5
Foot-candles per kilowatt	1.27	1.11
Kilowatts per foot-candle	.794	.901
Foot-candles per watt per square foot	4.92	1.68
Watts per square foot per foot-candle	.20	.600

The above tests were made entirely on what may be termed low-ceiling installation.

The discussion was opened by A. D. Childs, who briefly explained the success which has attended the introduction of

the mercury vapor lamp. The prejudice on account of the color of its light is not difficult to overcome, and it has been found particularly valuable for newspaper work, printing-houses, for lighting piers, and shop work of various kinds. There are at present from 15,000 to 20,000 lamps of this kind in use.

V. R. Lansingh called attention to the unit of illumination employed by Mr. Keech. This is the "foot-candles per watt per square foot." The designation of this unit is somewhat awkward although the quantity thus defined is very useful for making comparisons. The hope was expressed that the society, or possibly its committee on nomenclature and standards, might be able to coin a brief term for the unit. Mr. Lansingh then briefly referred to the two methods of illumination now employed in shop work. The first is general illumination, in which sufficient light is provided to take the place of daylight. The other is where the general illumination is less, but special illumination is provided at each machine. The conditions under which the two systems are most suitable vary, of course, with the character of the work, and it is not easy to make a suitable comparison between them. Further, in making a comparison between different systems of illumination up to date, only modern systems should be considered. It is not fair to compare a new illuminant with one which is antiquated. He thought that the light of the mercury vapor lamp is not objectionable after one gets used to it, though, of course, much depends upon the personal equation of the worker.

E. L. Elliott said that a great deal had been written and said about wasteful illumination, yet not too much has been said. The matter is one of very great importance, and should be carefully considered in all cases. Nevertheless, in considering this matter, one should not overlook the effect of poor illumination upon the workmen. The loss in labor due to poor lighting is much more important than the saving made by economizing in lighting. For example, a sixteen-candle-power lamp, at ordinary rates for current, costs about one-half cent an hour, and, under favorable conditions, where the current is generated at the shop, it may cost much less than this. On the other hand, a skilled workman gets sixty cents an hour, or even more, and if an ordinary workman lost from three to four minutes a day due to poor lighting, the loss this represents would be more than sufficient to pay for and keep up a first-class system of lighting.

Mr. Elliott agreed with Mr. Lansingh, that the unit of illumination employed by Mr. Keech was good, but, unfortunately, it involves four quantities. He thought this would, undoubtedly, prevent many from using it. About twelve years ago A. Blondel got up an excellent system of units for lighting and illumination, but these had never been generally adopted. To-day there are only one or two of his units which are used by a few engineers. As respects the effect of the color of the light from the mercury vapor lamp on the eyes it is as yet too early to decide. Ordinarily one would hesitate to use a light so rich in blue and in actinic rays, but the results seem to be good. When employing this light there is a peculiar relief of black letters on a white ground, which makes it so good for printing-houses. This, it was thought by Dr. Louis Bell, might be due to the monochromatic character of the light, on account of which the image formed in the eyes would show no chromatic aberration.

Referring to the instrument which had been used by Mr. Keech in the tests reported in this paper, Mr. Elliott said that a number of new illuminometers have been brought out recently, which are convenient and yet are fairly accurate. It is interesting to note that this development is largely due to the introduction of the high-efficiency metallic filament lamp. These lamps may be made in sizes suitable for standards, and yet for low voltages, and this, taken into consideration with their economy, makes it possible to use them in connection with a portable storage battery. Among the recent instruments are the Harrison photometer, which uses a flicker screen; the Trotter, in which the angle of incidence of the light from the standard upon the screen is varied; the Bell, which uses a Bunsen screen; the Ryan, employing an opalescent glass screen, and the Weber, which makes use of the Lummer-Brodhun screen. All of these use a tantalum standard incandescent lamp lighted from a storage battery. The development of these portable instruments constitutes an important step forward in establishing the profession of illuminating engineering.

M. K. Eyre regretted that the paper at hand had not considered more of the factors entering into the problem of illumination. To justify the title, more kinds of illuminants should have been tried, and the effect of the walls and the character of the finish should have been investigated. He asked whether an illuminometer making use of selenium could not be employed satisfactorily.

Replying to this question, E. L. Elliott said that selenium does not measure the luminous rays, but only those rays which affect its conductivity. It is therefore not altogether suitable for photometric purposes. However, an instrument utilizing this effect might be used under special conditions for integrating the amount of light given by an illuminant. This is something we know very little about, though it is of much importance. Various of our illuminants vary from time to time, and we do not know whether the values which we employ are true averages. In other words, the time element is neglected.

P. H. Thomas said that in considering problems such as those discussed in the paper, the illuminometer is the only instrument employed. However, it is almost impossible to get an instrument which will give a fair comparison of two or more illuminants. This matter usually takes care of itself in a standardizing instrument for the different tests, and any other errors which can not be avoided. He pointed out that a feature of the mercury vapor lamp, and one which is common to all tube lamps or lighting systems in which good distribution is obtained, is the absence of sharp shadows. Another valuable feature of the lamp is its independence of voltage. The candle-power does not vary perceptibly within a considerable range of potential. In industrial illumination a feature which is often overlooked is that with individual lighting, the operator ordinarily holds his lamp in his hand, and thus wastes time and the use of one hand. Mr. Thomas disagreed with the statement that the mercury vapor lamp gives monochromatic light. The peculiarity of its light is the absence of red. With this exception the spectrum is that of white light. This is the reason why it is so effective for printing-houses, because the paper looks white and the type black.

P. S. Millar said that it was an excellent thing that it has been found possible to use the new and peculiar lamps for industrial purposes, because they have a high efficiency. However, it is not always safe to base comparisons of efficiency on illuminometer measurements. Errors may creep in, and the color of the object to be viewed is important. The illuminometer usually measures the amount of light returned to the eye from a white surface. With many of the instruments

which had been referred to, errors even of twenty per cent may be unavoidable. With the Weber photometer, which had been employed in the tests, there is a difference of thirty-seven per cent in the illumination measured by it, according to whether the lamp from which the light is coming is in the line of the photometer or at right angles to it, although it is at the same distance from the test plane and the angle of the incidence of the light is the same. An illuminometer is merely a portable photometer; in fact, in all photometers, what is measured is illumination. Ordinarily the accuracy of these instruments is not greater than five per cent, although, in the laboratory, under the best conditions, an accuracy of a fraction of one per cent may be obtained. Mr. Millar thought that the close agreement obtained by Mr. Keech between his computed values of illumination and those obtained by measurement was a mere coincidence. This would not be possible under practical conditions, as there are too many variables entering into the work.

Mr. Lansingh again called attention to a point which he has brought up before. This is that the strain on the eye depends not only upon the intrinsic brilliancy of the source, but also upon the quantity of light entering the eye. So far as he is concerned, the latter may be as disagreeable as the former. He pointed out also that the illuminometer does not determine the ability of one to see, as this depends upon the color and character of the object viewed. The instrument measures only the amount of light falling upon the test plane. A high effect in foot-candles does not mean that it is easy to see.

Mr. Hubbard related his personal experience with the mercury vapor lamp, and said that as far as he was concerned, a large amount of light was not disagreeable, provided it was well diffused. He also gave some details showing how this type of lamp is coming into use.

Mr. Elliott, referring to the accuracy of photometers, said that, as usually constructed, they may, of course, be subject to much error, as the instrument itself, or even the observer, will cast shadows on the test plane if the illumination being measured comes from a diffused source; but these are errors of instrument, and could be eliminated by proper construction.

J. S. Codman then took the floor, and explained briefly the plans which the convention committee is carrying out for the meeting to be held in Boston, July 30 and 31. An excellent programme is being arranged, and many features of entertainment are being planned.

The meeting was then adjourned.

The Commercial Programme of the Thirtieth Convention of the National Electric Light Association.

A most important feature of the thirtieth convention of the National Electric Light Association was the "Commercial Programme," on Friday, June 7. The papers presented at the morning and afternoon sessions were of particular interest in view of the active work in which many central stations are engaged looking to increasing the demand for current for electric light and power. Owing to the number and length of the papers it is possible to give only the following brief abstracts in addition to what was presented in the convention report:

HOW TO GET NEW BUILDINGS WIRED.

J. SHELDON CARTWRIGHT.

As a general rule the majority of building syndicates, as well as individual owners, place implicit confidence in some one firm of architects and give careful consideration to any recommendations that the architect may make to them. Outside of the pecuniary gain that results to both the architect and builder on account of the increased cost, the architect occupies the same relative position to the owner as a lawyer does to his client. To the architect, then your central station solicitor should turn and continue his endeavors and make his arguments as to the advantages of having the proposed building wired. If possible he should arrange a meeting with the architect and owner together; and there is one thing that he should always remember, and that is, that those to whom he is talking and whom trying to convince are not supposedly technical on electrical matters, so instead of talking about volts, amperes, kilowatts, and similar terms, he must remember to talk plain, every-day dollars and cents.

There is still one other your solicitor can make use of, and that is the wiring contractor. There should exist an *esprit de corps* between the central station company and the wiring contractor, as there exists oftentimes among the general public a feeling that the solicitor representing a lighting monopoly is actuated entirely by selfish motives, and people are therefore more inclined to turn down his arguments than those coming from a less interested party.

COOPERATION OF THE ELECTRICAL TRADE PAPERS IN BUSINESS-GETTING.

F. W. LOOMIS.

In the past, and during the past year in particular, the trade papers have done exceptionally good work in assisting the new-business departments of the central stations throughout the country.

The work has been a success as far as it has gone, but it must go farther, and to make it do so, all must join in and help. There is not a contract agent in the country who knows every wrinkle for getting business, but undoubtedly each one does know some excellent points. Now, if each new-business manager will offer, from time to time his best selling points, or have his solicitors write of their experiences to the trade papers, the latter will be only too glad to use such matter in their business-getting columns. This method of cooperation is absolutely imperative. The trade journals can not do it all; they have been of great service to us during the past year and will be doubly so in the coming one, if the central station men will but help them a bit by doing their share.

All of the leading technical papers have expressed the desire, as well as the willingness, to better their new-business-getting columns, but they one and all remark the apparent spirit on the part of the central station men to receive all the information that they can through this medium, but to give none in return. The trade papers surely need our heartiest cooperation and assistance in making the coming year a success. They plan to enlarge their new-business departments, and to properly take advantage of this, all should contribute to help fill the additional space.

THE VALUE OF THE SERVICE OF THE ADVERTISING AGENCY OR SPECIALIST.

LAWRENCE MANNING.

Advertising is a vocation in itself, and the busy manager of any business—and the central station manager more than any other, I think—has not the time nor adaptation, very often, to plan and carry out the details of an effective advertising campaign. It is here that the advertising agency or specialist comes to the rescue of the central station manager.

With its organized corps of specialists the advertising agency or specialist takes the situation of the central stations—which is very similar in general the country over—in hand and adapts an advertising campaign to the individual station needs with mere suggestions from the central station official as to the special local conditions to be considered.

DISPLAY ROOM AND DEMONSTRATION AS BUSINESS-GETTERS.

E. R. DAVENPORT.

The value of a display room and demonstration as business-getters for central stations is now being realized by many, and speaking from the experience of the company with which I am connected I can say that I consider them among the most important factors in connection with a new-business department. The majority of gas companies maintain a display room, even in places where they employ no solicitors for new business and do no other advertising. This tends to prove that it is a wise policy to adopt, and must be considered by them a large factor for getting business, especially those companies using it without other aid.

To obtain the best results, the display room should be located in a store on a prominent street, with large show windows brightly and attractively lighted, and kept open evenings. Manufacturers are gen-

erally willing to cooperate, and apparatus can be secured from many of them on consignment, as it gives them an opportunity to show their goods under most favorable conditions.

SALES POLICY OF A COMBINATION GAS AND ELECTRIC COMPANY.

F. A. WILLARD.

Give the consumer the most for his money. Carefully consider his interests, and in all cases install the service that will give him the most satisfactory results, economy and practicability considered. Take the time and trouble to demonstrate to him, by figures so far as possible, the advantages of the installation you recommend.

In every town of 25,000 inhabitants or over there are electrical contractors whose business it is to sell and install electrical appliances, from the sale of which they expect to make a living profit, and as this class of people are good agents for the electrical corporation, I believe it is wise to protect them in so far as it is consistent with the policy and operation of the company.

The company should also maintain a wiring department, which so far as possible should be operated so as to produce the same margin of profit as appliances.

The question of lighting by combination gas and electric companies has, I think, been solved by most companies along the lines mentioned—that is, as far as possible, all long-hour business to electric lighting; all short-hour business to gas.

In the better class of residences in any town or city I would recommend soliciting both gas and electric lighting. You will find that people of this class favor the use of gas for fuel and special appliances. They will also use combination fixtures throughout the residences. By so doing you will get a larger revenue from each than you would if you allowed but one service in a house. To verify this I have selected in our own town (Rochester, N. Y., 200,000) several streets at random throughout the better section.

There is sometimes an inclination among subordinates of any gas and electric company to make the assertion that certain consumers who make complaints are kickers. Sometimes this is partially excusable, but this condition is absolutely wrong and every effort should be exerted to educate subordinates not to take this stand, no matter what the nature of the complaint may be. The consumer in making the complaint is virtually asking you to sell him your product, and you should be more than willing to make any reasonable adjustments necessary to that end. After a complaint has been adjusted a letter should be written to the consumer, stating what you have done and asking him if the work has been completed to his satisfaction.

ADVERTISING RESULTS DEMONSTRATED.

E. S. MARLOW.

The value of an advertising manager of ideas and good business instincts is fast becoming appreciated by the officials of central station companies and by persons financially interested in them, and it is not going too far to say that the results of his work should be made a matter of close record by the association to the same relative extent as the results obtained in any other branch of the business. Such a record would enable executive officials to determine more accurately what proportion of the company's gross revenue should be spent in the exploitation of the merits of its product through regular advertising channels, also the proportional amount that should be set aside for each form.

As it is generally conceded that the advertising manager's work is to a great extent an experiment to discover what in detail will be the very best way to spend the money which the company employing him places at his disposal, really valuable information on the subject of traceable results would tend to eliminate a great deal of the "hit or miss" from his efforts. Such information can be obtained only after the various companies of this association have applied themselves to the work of keeping a rigid account of the direct replies received from each piece of advertising matter sent out, the contracts closed as a result, the value of the business thus received, and the net expense of securing same.

NEW BUSINESS—HOW TO GET IT—HOW TO KEEP IT.

FRANK M. TAIT.

Every central station should provide a library containing a number of the best books on the various branches of the business, and also have on file the various electrical magazines and papers, to enable the young men in the various working departments of the company to qualify themselves theoretically as well as practically for the position of an expert on the new-business force. The solicitors can also make good use of this library and, as a result, will become better new-business solicitors. The most aggressive central stations in the country to-day complain of the difficulty of procuring men who can continually bring in the profitable new business required. The salary commanded is high and the training excellent, with a wide field always before the expert solicitor.

Lectures and talks should be given regularly to the new-business force by authorities on the best ways and means of obtaining profitable business.

The use of the local newspapers should be undertaken with cuts and well-written advertisements properly displayed and frequently changed. This is a part of the new-business effort that should be carefully looked after, as considerable money may be wasted if the subject is not intelligently handled. The newspapers are also likely to be friendly, especially if your company's attitude is right, the service good, and the rates normal.

The use of short, crisp, well-written individual letters setting forth the particular branch of business you are endeavoring to advance, should be mailed at regular intervals to a selected list of prospects, and in alternate mailings reply postal cards addressed and stamped for return should be enclosed. These mailings may be as frequent as the conditions warrant, and the replies received will be very gratifying if the letters have been properly framed, and the solicitor is thus given an excellent opening to present his case.

No opportunity should be lost sight of to keep the progressiveness of the central station before the public, for the live community likes to feel that its business interests are wideawake, and the dormant locality should be aroused by the aggressive lighting company whose name should always stand for progress. The lighting company can do a great deal to dispel the lethargy by boulevard and public square lighting, sign and bill-board lighting, outline, window and decorative lighting, and so forth.

Every electric light company should install one or more attractive electric signs, properly located to be effective, and burn same every night; bill-boards can likewise be used, with trough reflectors to illuminate same. These methods, while primarily intended to advertise the company's business, effectively point the way to others for a similar purpose and provide new avenues for the use of electric current.

Every progressive lighting company should have a display room of some kind, and it should be kept in first-class and attractive shape; not as many lighting offices and so-called display rooms are usually found—unclean, dusty, full of cobwebs and half-broken and disabled apologies for modern electrical appliances and apparatus. The display room, if possible, should occupy the front part of the main office, with the desks, cages, and so forth, of the working office force arranged across the room and well to the rear of the office.

The new-business department should be provided with weekly load-curves of the output of the station and the subsequent week's curves superimposed, so that each month may be compared with previous months, and so forth, and the effect of the new business watched.

HOW TO MAKE THE MOST OF NEWSPAPER ADVERTISING.

A. D. MACKIE.

To get the most out of newspaper advertising (in the estimation of the writer) requires a specialist to prepare the copy. A bookkeeper can not do it—a stenographer can not do it; would you call in a lawyer to treat your wife for a fever? No! it requires a specialist—one who has given the particular disease thought and attention, who has made a study of the treatment required for the case, and knows just how to diagnose it. So it is in advertising to-day—unsecured business is a disease and if treated properly can be cured, but if let run, is fatal. Advertising right requires thought, individual treatment and undivided attention.

Newspaper advertising used to awaken

the public to the possibilities of electric service and to impress it with the fact that your business is governed to the largest possible extent by the same principles applying to any retail business, has a very great effect, and it will also get some business; but it takes a combination of newspaper advertising, mail literature and personal solicitation to take the kinks out of the day or night load. Use the newspapers as a forerunner of enlightenment or to "blaze the trail" for the more "direct-to-you" methods of publicity.

EDUCATION OF THE SALESMAN.

J. D. KENYON.

It is becoming more apparent every day that there is a science underlying salesmanship, and that there is a necessity for men engaged in that line of business to master this science so their knowledge may be increased and their skill become greater every day through the understanding of and operating in harmony with the natural laws governing the sale of goods. There is a cry constantly going up for men of ability in this direction—men who have the power of persuasion, men who not only know how to get business, but to build business. Every concern has an opening for a man who is really a salesman, but the supply is very limited. The man who is skilful is already employed, and he is too much interested in his work, as a rule, to be looking for other positions. Managers can not sit and wait for good men to show up; they must take the best they can get and see that they are trained—trained scientifically. The electrical engineer knows all about the different parts of machinery that is used in connection with electricity. He knows how such machinery is put together; how it operates; how to connect the wires; how to turn on the power; how to generate that power. So the salesman must become familiar with all the elements that enter into the power of persuasion. He must understand them logically, he must understand what the power is, what generates the power, how much of the power to turn on and when to turn it off. It will be my pleasure to outline for you a few ideas that experience has taught to be the most practical and profitable line of study and research yet discovered for the development of ability to get business and build business. In the brief time allotted me it will be impossible to go into this subject at any length, and so I will only be able to touch the high places as it were.

NEW BUSINESS BY INDIRECT METHODS.

L. D. MATHES.

The Union Electric Company, of Dubuque, has for the past two years made a special effort to secure additional connected load from the residential districts. Bulletins, circular letters, special matter furnished by the trade, newspaper space and personal solicitation have been used to bring about the desired results. That the seed thus sown has been well sown is evidenced by the securing of a large amount of business that we have been pegging away at for several years.

The first plan was to put on a simple cooking demonstration with a daily lecture, introducing at the same time the sewing-machine motor, electric iron, chafing dish, heating pad, and other of the well-known and thoroughly reliable devices. It came to the attention of the company that the Household Economics Division of the Dubuque Woman's Club was ambitious to enlighten the public along the lines of domestic science. This club has a membership of 400 of the city's representative women. The company realized that the hearty cooperation and support of the club would lend a tone and dignity to the proposed demonstration that it would be impossible to otherwise attain. Knowing that the club would not consider lending its name to any movement that was plainly based on commercialism, the company made a proposition, which, stated briefly, was as follows:

We, the company, will take care of every item of expense involved in a fifteen-day series of lectures and demonstrations, provide the demonstrators, tools, appliances and foodstuffs required, and undertake all expense of entertainment of the lecturers who may respond to an invitation of the division.

The first and most important feature was the construction of a model six-room cottage.

There were no demonstrations in the cottage proper, but it was at all times illuminated, with an attendant who manipulated the flush switches to show the visitors the various effects obtainable. The 15,000 people who passed through the cottage went in over the front porch, through the main hall into a rear hall affording a second view of the dining room, by pantry through the kitchen into a passage leading to the main demonstration hall.

Formal opening of the series was a reception to the Dubuque Woman's Club by the Household Economics Division. Admission was by card of invitation.

The only advertising shown in the hall during the series was the sign of the contracting firm and in one section or corner of the hall a group of cards stating that the various furnishings were from the firms whose names were mentioned. The only paid advertising in connection with the announcements of the lectures and demonstrations consisted of a double-column five-inch space inserted in the three daily papers and carried throughout the course.

Each of the papers devoted from a half to a column and a half of reading matter each day in a recitation of the progress of the work. The company's scrap-book contains over fifty columns of solid reading matter, all of which the newspapers were glad to publish from the fact that it was regarded as live news matter.

During the series there were special evening features consisting of lectures by individuals well known in the field of domestic science. There was also an evening devoted to a discussion of the advisability of introducing domestic science, or the art of home-making and housekeeping, in the public schools, in a regular course. This debate was participated in by the superintendent of the Board of Education and many of the progressive minds of the city.

One feature of the demonstration was an afternoon devoted to the children. Ten demonstrators and attendants prepared and distributed candy and cake to 700 children at the conclusion of a simple little lecture by Mrs. Sanborn.

Within fifteen days following the demonstrations, the contractor who had an exhibit placed on his books sixteen house-wiring orders. The contractor and the company have received orders for six sewing-machine motors, eighteen electric irons and twelve or fifteen pieces of miscellaneous heating devices. In addition to this some thirty or forty residential contracts are being figured, with every indication of the greater percentage being closed.

NEW BUSINESS BY INDIRECT METHODS.

GEORGE STEINWEDELL.

When the St. Paul Lodge of Elks planned a pure-food show and home industrial carnival to be held for a week in the armory, it presented a peculiarly appropriate opportunity to demonstrate to the people of St. Paul the many sanitary and other reasons for the use of electricity for cooking, heating, lighting and ventilating, and to show the possibilities of improved electric appliances.

The armory building was well adapted for the purpose. Upon the space reserved for the company, in the centre of the hall, an octagonal booth was erected, provided for serving and demonstrating on all sides, thus reaching a large number of people at the same time.

Two of the representatives were detailed each afternoon and evening for duty at the show to explain appliances and answer questions. For the direct demonstration of the appliances, the ten young lady demonstrators regularly employed by the company were admirably adapted for showing the operation of appliances to best advantage, as each of these young ladies is a graduate of the university school of domestic science, and can talk intelligently on subjects of domestic economy, as well as show how to make a welsh rarebit in the electric chafing dish, or use an electric flat-iron.

The result of this show more than fulfilled expectations; the number of people attending during the week was about 35,000, and from the position in the community of the men behind the enterprise, the publicity gained was most valuable.

The second show of this kind in which the company took part was in April of this year. This show was given by the Junior Pioneers and was called the "Streets of Paris." It was held in the St. Paul Auditorium, which had been completed and turned over to the city only a few weeks

before. The perfect appointments and popularity of this new auditorium, built by popular subscription by the people of St. Paul, assured the success of the undertaking, and not less than 50,000 people attended the show during the week. The methods of demonstrating at this show were similar in every respect to the previous one, but the design of the booth, resulting from the nature of the carnival, was even better adapted for display purposes.

CATERING TO POWER FOR AUTOMOBILE CHARGING.

R. W. ROLLINS.

In past years the use of electric vehicles has been limited, owing to the fact that the direct-current system of the Hartford Electric Light Company covers a territory of only about one-third of a mile from the point of distribution in the centre of the city. A demand was immediately created for a low-priced device for straightening the alternating current, enabling the charging of batteries in the alternating-current district.

November 25, 1904, the Hartford Electric Light Company ordered ten mercury rectifiers and since then has placed successive orders from time to time until, at the present time, we have in use on our alternating-current system forty-four of these equipments, which are giving excellent satisfaction. The gross receipts during the year 1905 from both the alternating and direct-current systems for charging purposes were $3,381.81; for the year 1906 these gross receipts were $4,441.90. In these amounts all the garages are included. Of these gross earnings, $1,402.24 in 1905 and $1,496.06 in 1906 were derived from a flat charge for the supply of electric current, together with the maintenance of batteries for three electric vehicles, two of which belong to the police department (one ambulance and one police patrol wagon), and the third, a bus belonging to the Hotel Heublein. We made contracts with these people, agreeing to manufacture for them their batteries complete for one-half the cost of same to us and to supply charging current and maintain the batteries at a cost to them of $1.75 per day for each vehicle for 365 days per year. This scheme has proved to be a very profitable one to us and very satisfactory to our customers.

We have in use in the streets of Hartford approximately seventy-five electric vehicles. The Electric Vehicle Company of our city is manufacturing an exceedingly pleasing and artistic line of pleasure carriages of the runabout and victoria type, the victoria type being looked upon with special favor by the ladies, many of them being seen daily running their own carriages through our picturesque streets and parks.

To ascertain what is being done with the mercury rectifier in other central stations, I sent out a list of questions to thirty representative companies, and eleven of these companies responded, but the information obtained was very limited and very little enthusiasm was expressed. The gross receipts recorded by those who responded to the questions ranged from $1,200 per annum down.

The current cost for the operation of electric runabouts is very small. The average cost of current consumed for seventeen pleasure runabouts in the city of Hartford for the year 1906 was $3.19 per month, among these customers being several doctors who wish their vehicles ready for service at all times.

COMMERCIAL METHODS OF EXPLOITING HEATING APPLIANCES.

THEO. K. JACKSON.

The Mobile Electric Company was purchased by Messrs. H. M. Byllesby & Company, of Chicago, in 1906, and actively taken charge of in June of that year. At the time of the purchase of the properties now consolidated as the Mobile Electric Company, there were not two dozen electric irons in use in the city of Mobile. Incident to the large work of reorganization there was no opportunity to engage actively in the development of a new-business department until August of 1906. In August, 1906, a campaign was started looking to the introduction of electric irons. This campaign was started by extensive newspaper advertising for the first thirty days, making a thirty-day free trial offer. This was followed up by canvassers being sent from house to house, leaving electric irons wherever possible with a request that they be tried, and if in anywise unsatisfactory, either on account of practical inefficiency or high cost of operation, be returned when called for by the solicitor. The only thing required from the consumer when the iron was left was a receipt for same which called for payment of $4.00, the price of the iron, at the end of thirty days, or the return of the iron. Conjointly with this the literature of a well-known advertising company was sent out very freely, and the results have been very pleasing. Since August and up to April 30, 640 electric irons have been accepted and paid for by the consumers of this company.

We have one laundry in this city that operates entirely with electricity. Not only is electric power used as a motive power, and electric irons used for ironing, but the rolls on the larger machines are all electrically heated. This laundry at the present time uses about thirty-five irons. We have another laundry that is using eighteen irons. This is the only electric equipment outside of the lighting that the second laundry has.

We have not, up to the present time, succeeded very well in our efforts to introduce electric cooking devices. We have introduced about six dozen cooking devices of all kinds, the greater part of which were milk-warmers. We have introduced a number of waffle and gridirons and chafing dishes. One set of waffle irons in a hotel is working with entire satisfaction to the proprietors. We attempted to introduce cooking stoves by presenting one for a free trial to a consumer, but were unfortunate in the results obtained. We are just preparing to start an active campaign along this line by newspaper advertising and personal solicitation. Whether or not we shall succeed in our efforts, we, of course, do not know.

Our power department has contracted an average of 185 horse-power per month since its organization. Our sign department has increased our business by $7,200 per year of flat-rate signs since January 1, 1907. The total number of contracts written from January 1, 1907, to April 1, 1907, was 650; this in face of an increase in lighting rates

The population of Mobile is between 60,000 and 70,000 inhabitants.

ILLUMINATING ENGINEERING AS AN AID TO SECURING AND RETAINING BUSINESS.

C. F. OEHLMANN.

The work of the illuminating engineer is not only to call upon architects, contractors and owners of new buildings, to adjust complaints by the rearrangement of what has been a poor lighting scheme, to educate the electrical wireman to the economy of electric lighting from an illuminant standpoint, but to educate the representatives and salesmen of the new-business department. The latter is the real work of the illuminating engineer and is what makes his work valuable to the central stations. This work may be accomplished in many ways, but the real object is to have the representatives advise with consumers and prospective consumers, making proper suggestions as to the actual necessary installation, neither too much nor too little. Mr. Doherty once reminded the writer that an engineer was a man who could do with one dollar what an ordinary person would use two for.

Representatives making the mistake of advising too much light are in far greater error than in advising too little and are more to be feared, inasmuch as it results in a complaint from the common cause, a high bill, and means either a discontinuance of service or a special rate; and I should like to say at this time that I would prefer to lose the business rather than to make a concession in the rate, thereby admitting my rate to be in error.

METHODS OF SECURING RESIDENTIAL BUSINESS.

R. C. HEMPHILL, JR.

The first step is to gather the data necessary to lay out a campaign. Select from among your employés two or more good-looking, bright-witted chaps, dress them up in their best clothes and send them out to make a house-to-house canvass.

The line of talk these canvassers are trained to give during this preliminary canvass is as follows: They call for the lady of the house. "Madam, I am the representative of the electric company. Do you have our service?" "No, we use gas." "Can I not interest you? A number of your neighbors are using our service. Our rates have been materially reduced, and the management thought that this spring

you would be interested in having us explain its advantages."

If he finds the house is connected on our circuits the talk runs something like this: "I am a representative of the electric company and called to see if our service is entirely satisfactory, and if there is anything we can do for you. The management wants your cooperation in giving good service, and if you can suggest anything along that line we will be glad to hear of it."

It is certainly astonishing what a pleasant feeling is at once established between the company and the consumer, indirectly paying more than the entire cost of the canvass.

We carry on various advertising campaigns, trying to supplement the work of our canvassers.

First—Newspaper Advertising. We carry a double-column, five-inch space with each daily paper, changing the advertisement every week.

Second—Direct-by-Mail Advertising. We mail to fifty per cent of our residences monthly bulletins. We get results not only by pleasing customers but also in getting others to discussing various appliances.

Third—Exhibition Room. We have in connection with our office a large display window and exhibition-room, kept attractive by frequent changes. We endeavor each month to adopt a special feature.

Fourth—We endeavor during April of each year to give a week's practical demonstration of heating and cooking devices. In conducting a demonstration the chief aim should be to give it tone. The class of people you want to attend is not the class that goes to free exhibitions, and the class that goes to free exhibitions is not the class you want.

COOPERATIVE LIGHTING OF STREETS BY MERCHANTS.

H. J. GILLE.

Business men, as a rule, appreciate the benefit derived from something out of the ordinary, especially if it has strong advertising merits. If business men are public-spirited anything that will advertise the city in which they are doing business will appeal to them, especially if they derive direct benefit from it.

I will not enter into a lengthy discussion of the advantages to a city and to the merchants of ornamental street lighting, which must be apparent to all who have given this subject attention, but will give the methods employed in developing this system in St. Paul.

The cooperation of the merchants necessary to carry on a lighting scheme of this kind, was accomplished by means of improvement associations. The plan in organizing these associations was for several prominent merchants on a street to call a meeting of the property owners and tenants on that street. At this meeting, after stating in a general way the plan of illumination, a committee was appointed to submit designs for posts, plan and location, together with an estimate of the cost. Two committees were appointed in each block, one on each side of the street, for the purpose of getting signatures from property owners and tenants agreeing to pay their proportion of the installation and maintenance expenses—it being understood that the property owners were to pay for the installation and the tenants for the maintenance.

METHODS OF SECURING SIGN, OUTLINING AND WINDOW LIGHTING.

HOMER HONEYWELL.

We set a good example by outlining our building, lighting up the windows and installing the largest electric sign in town.

A good live prospect in each line of business was selected and worked upon until he lighted up. He was then used as a pacemaker for other merchants. When his rivals installed lights the pioneer in the field was induced to increase his display. It is a noteworthy fact that the merchants who use this form of advertising are continually increasing their original installation.

We used newspaper advertising, personal letters, mail advertising, starting in with one card a week, then two, and so on until the prospect received one each day for a week. This advertising was closely followed up by the solicitors. The mail advertising was neat, attractive and to the point, and served to put the prospect in a receptive mood, so that the solicitor could close quickly.

No Dull Times at the Allis-Chalmers Works.

The recent cry of "dull times," raised by various manufacturing interests of the country, finds no echo in the business of Allis-Chalmers Company, which continues to show a steady gain. During the month of May this company shipped from its works 552 cars of machinery, which was a gain of twenty cars over the record established for April. In April the aggregate weight of shipments was 21,680,847 pounds, while for the month of May the figure had risen to 23,772,242 pounds, making a total weight for the two months of 45,463,089 pounds. Cars bearing this enormous quantity of machinery, if coupled in one train, would have covered a distance of about eight miles.

The Vermont & New Hampshire Independent Telephone Association.

The fifth convention of the Vermont & New Hampshire Independent Telephone Association will be held on Tuesday and Wednesday, July 9 and 10, at the Hotel Low, Bradford, Vt. A number of interesting papers will be read, and topical discussions indulged in. The local committee is preparing an entertainment for the ladies, and the annual banquet will be served at 7 o'clock Tuesday evening, July 9.

The secretary of the association is G. W. Buzzell, St. Johnsbury, Vt.

ANNUAL MEETING OF THE ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.

ATLANTIC CITY, N. J., JUNE 19-20-21.

JUNE 19—MORNING SESSION.

The session was called to order at 10.30 A. M. by President E. A. Chenery, of the Missouri Pacific, who expressed his gratification at seeing so many "intelligent and good-looking" members present, and outlined the purposes of the organization, and in brief went over the programme as prepared by the topic committee.

After a statement by Charles Selden, of the entertainment committee, that the members, with their wives and sweethearts, would be expected to find their own entertainment, which was easy in view of the proximity of the Boardwalk, the principal attraction of Atlantic City, and certain instructions relative to having a group photograph taken, the convention took a recess of fifteen minutes in order to give the members an opportunity to renew old and form new acquaintances.

Upon reconvening the following new members were elected:

ACTIVE.

J. L. Henritzy, Supt. Tel., C. & S., Denver, Col.

L. M. Jones, Asst. Supt. Tel., A., T. & S. F., Topeka, Kan.

S. L. Van Akin, Jr., Supt. Tel., N. Y. C. & H. R. R., Syracuse, N. Y.

J. B. Fisher, Supt. Tel., Penna. R. R., Philadelphia.

W. S. Melton, Supt. Tel., O. & C., Chattanooga, Tenn.

G. A. Dornberg, Penna. Lines, West, Pittsburg, Pa.

E. A. Patterson, Asst. Supt. Tel., C., M. & St. P., Milwaukee, Wis.

ASSOCIATE.

Geo. M. Dodge, Valparaiso, Ind.

J. G. Mitchell, North Elec. Co., Cleveland, O.

Howard E. Merrill, U. S. Electric Co., New York.

Harrison Osborne, U. S. Electric Co., New York.

Wm. H. Merrill, U. S. Electric Co., New York.

R. D. Brixey, Kerite Cable Co., New York.

Byron C. Eldred, Duplex Metal Co., New York.

John Langan, Okonite Co., New York.

S. Johnson, U. S. S. Co., New York.

Henry W. Sperry, New York.

HONORARY.

Geo. L. Lang, Chattanooga, Tenn.

W. J. Holton, Chicago.

John B. Taylor, Gen. Electric Co., Schenectady, N. Y.

Secretary Drew asked that the action of the executive committee in issuing the printed circular relative to obtaining uniform legislation on the subject of wire crossings be approved, which was done.

The treasurer's report was presented, showing a balance on hand of $93, which was accepted.

A paper, entitled "Education of Telegraphers in Railroad Work," by H. C. Hope, of the C., St. P., M. & O., was read. After extending Mr. Hope a vote of thanks, the paper was discussed by Messrs. Selden, Rhoads, Williams and Ryder.

After the reading of numerous telegrams of regret, the meeting adjourned until afternoon.

AFTERNOON SESSION.

As the first order of business, Mr. Davis read the paper prepared by F. E. Bentley, of St. Louis, entitled: "The Superintendent of Telegraph; What He Is *versus* What He Is Not." Mr. Bentley was unable to be present. This paper was discussed by Messrs. Selden, Hope, Davis and others at some length, which, together with the paper itself, was of much interest.

John B. Taylor, of the engineering department of the General Electric Company, gave a talk on inductive disturbances to telegraph wires caused by high tension lines paralleling railroad rights of way, prefacing his remarks with the statement that inductive disturbances, as a rule, were due to line construction rather than to the instruments, and made the main portion of his talk more or less scientific, describing cause and effect and the several factors entering into the question of disturbances.

A long discussion followed these remarks, and Mr. Taylor was plied with many questions.

W. C. Stowell, of the C. & A., not being present, Mr. Parsons read his paper, entitled: "Inductive and Other Foreign Disturbances to Telegraph Lines."

The meeting adjourned for an executive session at 8.15 P. M.

JUNE 20—MORNING SESSION.

The convention was called to order at 9.30, and William Maver, Jr., read a paper, entitled: "Wireless Telegraphy; Some of Its Practical and Commercial Aspects." Mr. Maver's paper was lengthy and exceedingly interesting, and gave facts upon a subject of comparatively recent origin. In connection with the reading of the paper an invitation was extended to the members to visit the wireless station on Young's Pier, close by the meeting place. The system was also explained by Mr. Marshall, and its various uses and advantages detailed.

This was followed by a paper prepared by S. Lewis Van Akin, Jr., N. Y. Central lines, entitled: "Maintenance and Operation of Telephone Service on Railroad Companies' Lines." The writer handled the subject in a way which showed entire familiarity with the telephone service in connection with railroads. The discussion brought out much of value in reference to experiences on different lines.

Mr. Chetwood, of the American Telephone and Telegraph Company, New York, gave a short talk detailing their work in the way of new apparatus, etc.

JUNE 20—AFTERNOON SESSION.

The meeting was called to order at 2.30, and G. A. Cellar, of the Pennsylvania lines, read a very important paper, entitled: "Experiments With Concrete Poles."

Mr. Camp, of the Canadian Pacific, lead the discussion, which was continued at some length.

The paper prepared by U. J. Fry, of the C., M. & St. P., entitled: Dry Batteries," was read by Mr. Ryder. The paper consisted mainly of a comparison of cost as compared with the gravity cell.

It was here decided to continue the convention a third day.

The next paper was one by G. W. Dailey, of the C. & N. W., entitled: "Opportunities With the Telegraph Service." Mr. Dailey's paper was well received and deservedly so, as he had evidently given the matter considerable study and presented all sides of the subject.

ELECTION OF OFFICERS.

The following are the newly elected officers:

President, E. P. Griffith, Erie Railway, Jersey City, N. J.

Vice-President, W. J. Camp, Canadian Pacific, Montreal, Canada.

Secretary, P. W. Drew, Wisconsin Central, Milwaukee, Wis.

Montreal, Canada, was selected as the next place of meeting.

JUNE 21—MORNING SESSION.

The convention was called to order at 10 A. M., and the first paper considered was by L. M. Jones, of the A., T. & S. F., entitled: "Wire Testing."

The committee on legislation for wire crossings, through its chairman, Mr. Groce, presented its report, which detailed efforts to secure desirable acts in the different states and the results, and was accompanied by acts which were considered about as satisfactory as could be had at the present time. This was followed by a discussion which, among other things, brought out the difficulty in securing railroad legislation in view of present unfavorable feeling throughout the country toward such corporations.

Secretary Drew suggested that if trainmen were interested they could probably do as much with the legislators as could the officials, as they have better opportunity to become acquainted with them and have fully as much influence.

It was moved that the report be printed separately and distributed, and the committee continued.

The dates for the next convention were determined as June 24, 25 and 26, 1908.

The following papers were not read but ordered published, owing to lack of time:

"Standard Time," W. J. Camp, Canadian Pacific.

"Error Sheets," R. L. Logan, Kansas City Southern.

"Operation and Maintenance of Railway Telegraph Service," W. J. Browne, Iron Mountain Railroad.

"Visible Supply of Telegraph Poles," W. W. Ashald, Grand Trunk Railway.

"Uniformity of Office Installation," E. Parsons, I. C.

A motion to print the papers without reading and thus close the convention, produced some discussion, but the motion was carried by a vote of nine to five.

The report of the committee on Uniformity of Superintendent's Duties was presented by J. L. Davis, chairman, and ordered distributed.

E. P. Griffith, chairman of the committee to confer with the American Railway Association as to state laws reported progress.

It was decided, on motion of Mr. Ryder, that papers be printed hereafter, prior to the meeting of the conventions.

Mr. Davis presented a report of the committee to prepare a blank to be used in transferring train orders, etc., and unfinished business to the relieving operator. This blank was submitted and approved by the convention.

Ex-President E. A. Chenery was given a rising vote of thanks for services during the past year, and the various contributors to the success of the convention were also thanked.

The convention adjourned to meet in Montreal the last week of June, 1908.

Quite a few manufacturers and supply men were in evidence at the Marlborough-Blenheim in connection with this convention. C. E. Brown, of the Central Electric Company, Chicago, and John Langan, of the Okonite Company, were very much in evidence. The United States Electric Company, New York city, exhibited the Gill telegraphic selector, and the North Electric Company, Cleveland, Ohio, and the National Telegraph and Telephone Company, Philadelphia, Pa., also made exhibits.

The Faraday Society.

The twenty-ninth ordinary meeting of the Faraday Society was held on Tuesday, May 28, 1907, at the Institution of Electrical Engineers, London, England. Professor A. K. Huntington was in the chair.

A paper entitled "Contributions to the Chemistry of Gold," by F. H. Campbell, was read in abstract by N. T. M. Wilsmore.

Aurous iodide, AuI, was prepared and found to decompose at twenty-five degrees, according to the equation

$$2\ AuI \rightleftarrows 2\ Au + I_2$$

Since this equation contains only one variable, namely, the iodine, there must be a particular pressure of iodine at which AuI, Au, and I_2 are in equilibrium. This was found to be 0.943 of that of pure iodine; any solution of iodine will therefore act on gold if more than 0.943 saturated, but not if below this strength.

When gold is acted on by a solution of KI and iodine, part is converted into insoluble AuI and part dissolves. The experimental results with various solutions agree with the equilibrium equations only when the gold is assumed to enter the complex ion in the monovalent condition —*i. e.,* to yield AuI_2 ions.

The action $3\ AuCl = AuCl_3 + 2\ Au$ was found to occur at ordinary temperatures and in absence of moisture.

Dry chlorine and AuCl combine at ordinary temperatures to form $AuCl_3$.

Aurous oxide, Au_2O, was obtained after considerable difficulty, and its solubility in nitric acid determined. The oxidation potentials of various nitric acid solutions, saturated with aurous oxide, were then measured, and from these figures the normal potential for the tendency

$$Au \longrightarrow \text{metallic gold}$$

was calculated, and found to be + 1.5 volt against the hydrogen standard.

The small affinity between gold and iodine, the tendency to form a complex ion with iodine, the high oxidation potential of Au ions, and the very low solubility product of Au_2O all agree to confirm the assumption that Au forms very weak positive ions.

Professor Dr. R. Abegg (communicated) referred to the general question of the stability of the various peroxides and their oxidizing powers, and pointed out that the low oxides of the noblest metals could show as high an oxygen pressure as the peroxides of the less noble metals.

Dr. H. Borns drew attention to Wohlwill's work on the electro-deposition of gold from the chloride solution.

Dr. F. Mollwo Perkin read a paper on "Reduction of some Oxides and Sulphides by Means of Metallic Calcium."

The author first referred to the well-known powerful reducing action of aluminum, as, for example, its use in the preparation of chromium, ferro-silicon and other metals and alloys, and its use in the form of "thermit" for welding purposes. He finds that metallic calcium is a still more powerful reducing agent than aluminum. For example, when molecular proportions of aluminum and ferric oxide are mixed together and ignited by means of a fuse of aluminum and barium peroxide, intense reaction ensues, and continues until all the oxygen has been removed from the ferric oxide, and aluminum oxide and metallic iron produced in its stead. When metallic calcium in the form of fine turnings is mixed with ferric oxide and ignited in a similar manner, the reaction is so intense that the mixture is in large part ejected from the crucible. The reaction can be brought under control by mixing thirty to forty per cent of calcium fluoride or ten to twenty per cent of calcium oxide with the contents of the crucible. Boron can be obtained by igniting a mixture of boron trioxide with the calculated quantity of calcium and five to ten per cent of calcium oxide. If no calcium oxide is added the reaction is too violent. It is, however, very difficult entirely to free the boron from calcium even after standing over hydrochloric acid for weeks; the boron invariably contains considerable quantities of calcium, which is probably present as calcium boride. When borax is carefully dried and mixed with calcium, and the mixture ignited by a fuse, the reaction completes itself without undue violence. On treating the reaction mixture with hydrochloric acid, brown amorphous boron is obtained in almost theoretical quantities; the product, however, always contains calcium, but can be used for preparing boron chloride and similar compounds. Rather anomalous results were obtained when sand (silicon dioxide) was ignited with calcium. Unless considerably less than the theoretical amount of calcium was used, not silicon but probably calcium silicide was obtained, because when the reaction mixture is placed in hydrochloric acid, large quantities of a spontaneously inflammable gas are given off; this gas is probably silicon hydride. The product remaining behind is silicic acid and calcium chloride. The results were the same when a mixture of aluminum and calcium was employed.

Attention was also drawn to the difficulty experienced in causing silica in the form of fine sand to react with metallic aluminum which was in the form of a rough powder. A similar difficulty was met with in the case of boric anhydride and aluminum. Galena does not yield metallic lead and calcium sulphide, but a grayish mass which gives off sulphuretted hydrogen when acted upon with acids, lead in the form of a salt being left in solution. Red phosphorus and calcium unite with explosive violence. Sulphur and calcium also react with great vigor. Manganese dioxide and calcium require to be mixed with thirty to forty per cent of calcium fluoride, when a regulus of manganese can be obtained, otherwise the reaction is too violent. This is also the case with chromium oxide. When the experiments were first tried it was found that the reaction mixture always stuck to the crucible, and it was invariably necessary to break the crucible in order to obtain the product. Subsequently the difficulty was got over by lining the crucible with a paste made from slaked lime and a strong solution of sodium silicate (water glass); in the case of boron, the solution used was generally borax. The crucible and lining were thoroughly dried, and were then ready for use. With crucibles so prepared there was never any difficulty in getting out the reaction product in the form of a lump without breaking the crucible.

F. E. Weston said that he had succeeded in reducing silica in the form of kieselguhr by means of aluminum. He had recently used aluminum in the reduction of titanium compounds.

W. P. Digby asked whether calcium would, like aluminum, prevent segregation in steel castings.

Professor A. K. Huntington said that the state of division of the materials in these experiments was of paramount importance. He believed, answering Mr. Digby, that calcium had not proved a successful substitute for aluminum in pouring steel; the calcium oxide seemed to remain in the metal.

Prior to the ordinary meeting the annual general meeting of the society was held, at which the report of the council and the balance sheet were duly approved, and the following officers and council elected for the session 1907-8:

President—Sir William Perkin.

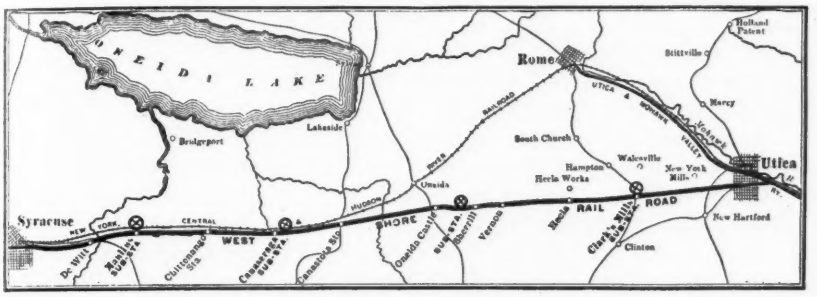
Vice-Presidents—G. T. Beilby, R. A. Hadfield, Professor W. Hittorf, Sir William Huggins, Professor A. K. Huntington, Professor A. Schuster, Professor J. J. Thomson.

Treasurer—F. Mollwo Perkin.

Council—A. C. Claudet, S. Z. de Ferranti, F. W. Harbord, R. S. Hutton, T. M. Lowry, W. Murray Morrison, J. Swinburne, N. T. M. Wilsmore, Professor E. Wilson, J. L. F. Vogel.

The Opening of the Electrified Division of the West Shore Railroad Between Utica and Syracuse.

On Sunday, June 16, regular passenger service was begun over the electrified division of the West Shore Railroad between Utica and Syracuse, N. Y. On Saturday, June 15, however, a number of prominent railway men were the guests of C. Loomis Allen, vice-president and general manager of the Oneida Railway Company, on a preliminary trip over the system. The party was divided into two sections, one section making the trip from Utica in a two-car train, in charge of Mr. Allen; and the other making the trip from Syracuse in a similar train, in charge of William J. Harvie, electrical engineer of the Oneida Railway Company. After an inspection of the substation at Clark's Mills, the guests were entertained at Baggs's Hotel, Utica, at luncheon.



THE ELECTRIFIED DIVISION OF THE WEST SHORE RAILROAD BETWEEN UTICA, N. Y., AND SYRACUSE, N. Y.

Among those present were C. E. Parsons, chief engineer of the Hudson River Electric Power Company; S. Piek, superintendent of the Niagara, Lockport & Ontario Power Company; H. N. Ransom, General Electric Company; N. M. Garland, Ohio Brass Company; M. J. Brayton, general manager of the Utica Gas and Electric Company; Paul T. Brady, Westinghouse Electric and Manufacturing Company; J. J. Stanley, A. L. Linn, Jr., of the Oneida Railway Company; W. K. Vanderbilt, Jr., Horace E. Andrews, H. B. Sykes and W. H. Spice.

The Legal Staff of the Interborough-Metropolitan System Reorganized.

A reorganization of the legal staff of the Interborough-Metropolitan street railway system has been announced by President Theodore P. Shonts. The personnel of the organization is as follows: Paul D. Cravath, general counsel, New York City Railway Company and subsidiary companies; George W. Wickersham, general counsel, Interborough Rapid Transit Company and subsidiaries; James L. Quackenbush, general attorney for all companies. Mr. Quackenbush was formerly general attorney of the New York City Railway Company. A. A. Gardner, formerly attorney for the Interborough Rapid Transit Company, has been appointed general solicitor for all the companies. Charles A. Gardiner has been appointed solicitor for the Manhattan Railway Company. Henry A. Robinson remains solicitor for the New York City Railway Company, and is also in charge of the bureau of real estate and taxes for all of the companies. The former attorney of the New York & Queens County Railway Company, Van Vechten Veeder, has been appointed attorney and solicitor for the litigation of all the companies in the borough of Queens and in Nassau county. The former attorney and solicitor for the Union Railway Company, Ambrose F. McCabe, retains this postion and is also attorney and solicitor for the litigation of the companies of Westchester county.

The Canadian Electrical Exhibition.

The Canadian Electrical Exhibition Company, Limited, will hold an exposition of electrical material and appliances at the Drill Hall, Montreal, Canada, September 2 to 14. The Canadian Electric Light Association will postpone its meeting from June until September, and it is probable that the Canadian Street Railway Association and the Maritime Provinces Electric Light Association will hold their meetings in Montreal in September. There is available for exhibition purposes about 16,800 square feet, and fully ninety per cent of this was taken within two weeks after the space was first offered for sale. The large Canadian manufacturers, such as the Canadian Westinghouse Company, Limited; Canadian General Electric Company, Limited; Allis-Chalmers-Bullock, Limited; Packard Electric Company, Crocker-Wheeler Company and the Bell Telephone Company of Canada have each taken over 1,000 square feet of space.

The officers of the Canadian Electrical Exhibition Company, Limited, are W. McLea Walbank, president; R. S. Kelsch, vice-president, and J. W. Pilcher, secretary-treasurer. Mr. Kelsch is the managing director.

The Master Car Builders Elect.

At the closing session of the convention of the Master Car Builders' Association, held at Atlantic City, N. J., June 19, the following officers were elected: President, G. N. Dow, Cleveland, Ohio. Vice-presidents: R. F. McKenna, Scranton, Pa.; R. W. Burnett, Montreal, Canada; T. M. Ramsdell, Richmond, Va. Executive committee: T. Curtis, Louisville, Ky.; R. F. Crawford, Pittsburg, Pa.; F. H. Clark, Chicago, Ill. Treasurer, John Kirby, Adrian, Mich. Secretary, J. W. Taylor, Chicago, Ill.

In addition to the exhibits which were briefly described last week the following notes will be of interest:

The Chicago Pneumatic Tool Company distributed some interesting literature describing and illustrating the air-cooled Duntley electric tools. Literature was also distributed devoted to the company's pneumatic apparatus.

The Westinghouse companies distributed a handsome album containing views illustrating the products and factories of the affiliated Westinghouse companies.

The American Blower Company demonstrated the blowing capacity of its high-pressure fans, a great deal of interest being shown in its exhibit.

The Independent Pneumatic Tool Company exhibited the "Thor" No. 8 close-corner drill, and attracted a great deal of attention. The company was represented by James B. Brady, president, and J. A. Porter.

The Electric Storage Battery Company was represented by E. L. Reynolds, Charles Blizard, Robert Hull, A. Taylor and E. H. Hunt. The company exhibited car-lighting batteries, portable batteries, and batteries of the power-station type.

The Gold Car Heating Company exhibited its car-lighting and car-heating system.

The Joseph Dixon Crucible Company exhibited its graphite specialties, and was represented by R. A. Brown, W. A. Houston, A. C. Bowles, J. J. Tucker, C. H. Spotts, H. A. Nealley and L. H. Snyder.

The Standard Paint Company was represented by J. N. Richards, F. F. Vandewater, J. H. Thomas, J. G. Satterthwaite, George Wilms and C. E. Earnshaw. The company exhibited its "P. & B" insulating material and its "Ruberoid" car flooring and roofing material. It distributed a neat card memoranda case as a souvenir.

REVIEWS OF CURRENT ENGINEERING AND SCIENTIFIC LITERATURE

Properties of Copper.

A general discussion of the properties of copper—physical and otherwise—is given here by A. H. Sexton. Those most interesting from an electrical standpoint are the effects of various impurities upon the electrical conductivity and the tensile strength. These reduce the conductivity of the copper markedly; in fact, small traces of impurities not detectable chemically are shown by a resistance test. Arsenic is always present in commercial copper, but there should not be more than 0.05 per cent. It hardens copper and increases its tensile strength, and for many purposes is not objectionable, but should not be present in copper intended for making brass. Antimony is much more objectionable than arsenic, but is usually present in smaller quantities, due probably to the fact that it is easily oxidized. Bismuth is the most objectionable constituent, and if present to the extent of 0.02 per cent, makes the metal so brittle that it can not be worked. Even a trace of bismuth is objectionable, but, fortunately this is not a common impurity in copper. Iron is seldom present in refined copper. Tin and zinc are sometimes present in very minute quantities, but never enough to be objectionable. Lead is never present in refined copper, but is sometimes added to copper that is intended for rolling. Nickel and cobalt are often present in small quantities, but do not seem to be objectionable. Sulphur is never present. Its tendency is to make the metal brittle. Phosphorus is never naturally present, but when used as a refining agent, a trace of it may be left. Carbon is not soluble in and does not combine with copper, and is never present. Cuprous oxide is the most common impurity. Even in small quantities it induces brittleness and causes the copper to crystallize in coarse grains. The average percentage of oxygen in well-refined copper is less than 0.1 per cent; in electrotype copper, about 0.01 per cent.—*Abstracted from the Mechanical Engineer (London), June 8.*

The Origin of Radium.

It was suggested some time ago that actinium is itself the true parent of radium, but no definite evidence has been brought forward to prove this. The matter has been under investigation for some time by E. Rutherford, and he gives here a record of his further observations. These have been continued on an old preparation of actinium, and it was found that the rate of growth of radium was uniform over a period of 120 days. This rate agreed closely with that observed in another solid preparation of actinium which had been set aside for a period of two and one-half years. Another sample of actinium was then taken and precipitated with ammonium sulphide in order to remove the radium from the solution. In this way a solution of actinium was obtained initially almost entirely free from radium. By examination it was found that the actinium after this chemical treatment contained an excess of radio-actinium, which was shown by the rise of the α-ray activity to be about twice its initial value in about twenty days. Then a gradual decay set in, falling to a steady value. For equal quantities of actinium the rate of growth of radium observed in this solution was one and one-half times greater than the normal. This indicated that only a portion of the actinium had been precipitated, while the radium-producing substance had been precipitated with the actinium in excess of the normal amount. This conclusion was confirmed by an examination of the filtrates, which were found to contain more than half the actinium. After suitable chemical treatment a small precipitate of actinium was again obtained, which was about 100 times as active as the original preparation. This precipitate was dissolved in hydrochloric acid and observations of the amount of radium were made at regular intervals. No appreciable growth of radium was observed over a period of eighty days. If there were any growth at all it was certainly less than one-two-hundredth part of that normally to be expected. From these observations the author concludes that in the ordinary commercial preparations of actinium there exists a new substance which is slowly transformed into radium. This immediate parent of radium is chemically distinct from actinium and radium and their known products, and is capable of complete separation from them. If this be true, the position of actinium in the radioactive series still remains unsettled.—*Abstracted from Nature (London), June 6.*

The Present Tendency of Charging for Electricity.

A discussion is given here of the tendency in England to-day to introduce a modified system of charging for electricity. A list of seventeen municipalities is given, and the method of charging at these is explained. No fewer than fourteen take into consideration the number of hours a day the consumer uses electricity. Three have adopted the policy of offering special rates to large consumers, irrespective of their load-factor. The double-rate system has been adopted by five, and two are trying the restricted-area system of charging. At one the charge is based upon the load-factor of the consumer, though it is not explained how this is obtained. A maximum-demand indicator would give it with sufficient exactness. In a good many instances low rates for power have been offered to mills and factories, but in some cases the power thus supplied is a considerable proportion of the whole and overlaps part of the lighting peak, so that the author believes this low rate is not just to other consumers. If 4,000 kilowatts in apparatus are required to supply both the lighting and power loads during the peak hour, while either one alone could be carried with a 2,000-kilowatt unit, it is thought that the power user should pay as much as the light user for the station reserve.—*Abstracted from the Electrical Review (London), June 7.*

On Recording Transitory Electrical Phenomena by the Oscillograph.

In attempting to apply the Duddell oscillograph to measuring brief current phenomena, such as the growth or dying-away of currents in circuits, J. T. Morris encountered a good deal of difficulty in devising a satisfactory method of closing the circuit. Tapping keys rebounded and did not close the circuit at once. A steel needle plunged into mercury was also unsatisfactory, as the contact was not sure. A knife-blade contact switch gave better results, but showed that the contact springs rebounded as the blade entered between them. Modifying the blade by placing a strip of ebonite on the front, so that the latter passed between the springs before the blade proper, entirely removed this trouble and produced a switch which

instantly and surely closed the circuit. This switch was operated by the falling of the photographic plate upon which the record was made, the switch being held open against a spring by a cord which was cut by the plate. The author gives a number of records showing how the current grows and dies away under various conditions. These indicate that the last switch described closes the circuit instantaneously within one-ten-thousandth of a second. In a circuit as nearly non-inductive as could be conveniently obtained, the current was found to grow smoothly and to reach its full value in about five-one-thousandths of a second. Curves were also taken for studying the phenomena accompanying the blowing of a fuse. One diagram shows that this required seventy-five-ten-thousandths of a second after the circuit was closed. The current rose rapidly to its full value, and then decreased as the fuse heated and the arc was drawn, and finally quickly died away. Curves were also taken illustrating the current rush in transformers, due to the magnetic condition of the iron when the circuit is closed. It was found also that there was practically no error introduced by retardation of the plate due to the cord. —*Abstracted from the Electrician (London), June 7.*

Soren Horth, Discoverer of the Dynamoelectric Principle.

A short historical sketch is given here of Soren Horth, a Danish engineer and inventor who, it is said, in 1854 discovered the dynamoelectric principle—that is, the method of causing a dynamo to supply current for its own field coils. Horth was born in Denmark, October 13, 1801. His first patent specifications for a machine of this kind were filed in 1854. His earliest work with electricity was the design of an electromagnetic engine which worked on the coil and plunger principle, the pole-pieces being coned so as to equalize the magnetic force. He visited England at various times, and in 1848 made a trip connected with his electromagnetic experiments. He spent three years in London, and during this time constructed an engine which was shown at the Great Exhibition of 1851, at which he was granted the only prize awarded for electric machines. On his return from England he began work on the dynamoelectric principle, as is shown by two papers deposited with the Royal Danish Scientific Society, one of these bearing the date December 8, 1851, and one May, 1852. These are specifications, written in English and accompanied by drawings, describing a dynamo. The machine apparently consisted of three or four rings of vertical magnets placed above each other, arranged around a vertical shaft which carried two or three rings of armatures. The hollow shaft, as well as the magnets, were provided with coils, around which the current induced in the armature was passed. One clause in the specification reads as follows: "The main feature of this battery consists in applying one, two or several permanent magnets of cast iron in connection with an equal number or more electromagnets shaped in such a manner that the currents induced in the coils of the revolving armatures are allowed to pass around the electromagnets. Consequently, the more the electromagnets are excited, the more will the armature be excited, and the more electricity, of course, induced in the respective coilings; and while a mutual and accelerating force is thus produced in this manner between the electromagnets and the armatures, an additional or secondary current is at the same time induced in the coiling of the electromagnets by the motion of the armatures, the said current flowing in the same direction as that of the primary current after having passed the commutator. The direction of the current induced in the coils of the armatures will, of course, be reversed according to the change of the respective polarities, and a commutator is therefore applied for the purpose of causing the same to flow constantly in one direction." This patent was never completed, but in 1855 a patent was granted for a machine constructed on the same principle. The last years of Horth's life were spent in Copenhagen, where he practised as a civil engineer. He died on August 28, 1870, shortly after the Danish government had granted him a considerable sum for the purpose of completing his experiments.—*Abstracted from Electrical Engineering (London), June 6.*

A New Method of Loading Transformers.

A simple and economical method of loading transformers for heating runs is described here by Axel F. Gustrin. It consists in a modification of the transformer test adapted from Hopkinson's circulating test of direct-current machines, but avoids the necessity for employing a second transformer. Single-phase transformers usually have the coils wound in two sections, and the sections of both primary and secondary may be connected up as a pair of transformers, taps being taken from one primary coil so as to enable the system to be unbalanced and full-load current to be circulated through the transformer with the full voltage applied. The same method may be used for polyphase transformers, or a small auxiliary testing transformer may be introduced into the primary circuit. The best arrangement is to connect the three coils of a three-phase transformer in star, and then, by means of the auxiliary transformer, the secondary of which is connected in series with the primaries of the test transformer, the current circulated through the latter is varied.—*Translated and abstracted from Elektrotechnische Zeitschrift (Berlin), June 6.*

Advantages of the Electric Drive.

The advantages of the electric drive for railway shops are here discussed by J. H. Klinck. In a comparatively recent instance it was found that a certain railway shop required, on an average, about 300 horse-power for operating when belt-driven. This was changed to electric drive, when the average load dropped to 150. The line shaft and belt drive is inflexible and requires that the heavy machine be placed near the engine. This may cause the material during construction to be carried back and forth an unnecessary amount. The electric drive does away with this and enables the machines to be placed in the proper order for facilitating the handling of material. Although many railway shops have been increased in size in recent years, it has been found that this increase has not made it possible to increase the output in engines and cars, because the size and capacity of the engines and cars has increased, as have all the parts which go into them, and this calls for more work than before. As the net result, it has been the experience of shop men in general that the increase in the capacity of modern tools is just about in proportion with the additional work necessary to be done upon each individual part of modern equipment or cars. In this connection a tool which could have its speed adjusted to the work would improve the situation considerably. The present tendency is to furnish all heavier and larger tools with individual motors, thus rendering the tool independent of line shafts, making possible its being placed in a favorable position for handling the heavier material by means of overhead cranes, and also making it possible to adjust the speed to the work in hand. Unfortunately, frequently the manufacturers of these tools object to the motor drive. From the railway point of view the most economical shop is the one which makes repairs most thoroughly and rapidly, so that a shop arranged for proper progress of the work is much the best, and to this end the electric drive contributes.—*Abstracted from the Electric Journal (Pittsburg), June.*

Methods of Getting New Business

A DEPARTMENT DEVOTED to the COMMERCIAL DEVELOPMENT of CENTRAL STATIONS

Managers are Invited to Contribute Suggestions for Methods of Increasing the Demand for Electric Service

EDITED BY CHARLES A. PARKER.

The Advantage of Knowing Your Business Thoroughly.

A little knowledge may be a dangerous thing, but not enough knowledge is ten times worse, in so far as it applies to some central station managers and solicitors.

What would you think of a man trying to sell you an automobile who couldn't tell you how the thing worked, or what it would do?

Yet many solicitors try to convince women of the advantages of electrical appliances in the home without knowing all about them themselves.

To illustrate:

A solicitor placed an electric flat-iron on trial in a house and guaranteed that it would not scorch. The lady believed him, and left the iron on a very expensive dress, without turning off the current, while she went to chat with an unexpected visitor. The dress was ruined, and the iron returned to the company next day with some very uncomplimentary remarks about trying to sell a thing by misrepresentation.

That one case, of course, would not have been so bad for the company, if it had ended there.

But it didn't end there.

That was only the beginning of the trouble.

For, as might be expected, the lady had to tell all her friends of the incident, with the result that where many of them had contemplated using the irons, they instead, became prejudiced against them.

If the solicitor had only known his business, he would never have made such a statement to the lady, or he would have been more explicit in his guarantee. As it was, his lack of knowledge did the company an irreparable injury, and lost them much new business.

Another case was where an electric heating pad was placed in a home where there was a baby. The baby was placed on the pad, but the mother, not knowing any better, failed to take the precaution of putting a rubber sheet between the child and the pad, in case of emergency. Result—the current was short-circuited and gave the baby a severe shock. In this instance it was plainly up to the solicitor to tell the buyer the rubber sheet was necessary. His ignorance cost the company a customer instead of getting one, for after that experience the lady could not be hired to have an electrical appliance of any kind in the house from fear of such shocks.

And like the other case, this one got noised about, and prevented the sale of electrical appliances to many others.

These two incidents will illustrate how insufficient knowledge on the part of solicitors will work much harm to the company employing them.

Therefore, it's up to every central station manager to see that his salesmen know as much as possible about the various electrical appliances so they can sell them to stay sold. Let them experiment in their own homes, or in the display room, until they are thoroughly familiar with all the different devices.

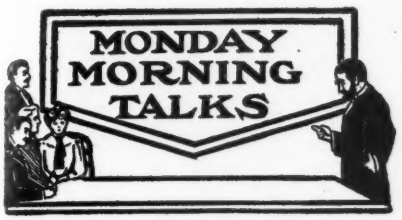
We must bear in mind that while electricity may be familiar to the men in the business, to the public it is still something

KEEP COOL
ON
IRONING DAY
BY THE USE OF AN
ELECTRIC
FLAT IRON
Over 200 have been sold in Madison since April 1st, and hot weather hasn't even started
PREPARE NOW
for the hot summer days by ordering one of these irons
ON 30 DAYS' FREE TRIAL
MADISON GAS & ELECTRIC CO

A full page advertisement of the Madison Gas and Electric Company, which appeared in one of the local papers. This advertisement was well displayed. The reading matter is short and to the point.

new, which they know very little about, and for which they must rely wholly on the say-so of the company's representatives. We must remember also that one dissatisfied customer works more harm than a hundred satisfied ones can counteract, for such incidents, like gossip, travel with the wind, and deter many people from using electrical appliances for fear the same thing might happen in their homes.

In the pursuit of new business it is more important to hold and satisfy a prospect who is really interested than it is to centre our energies on capturing those who have to be made interested. For in every house where you can install electrical devices that will stick, the greater becomes the chance of interesting the neighbors.



Under this general heading we shall present to our readers a series of bright, stimulating talks to solicitors, which, we believe, will prove valuable to managers of new-business departments in suggesting points which they can profitably bring out in their occasional meetings with the company's representatives.

We shall gratefully accept contributions and suggestions from any of our readers.

Boys, who are you working for, anyway?

The company, primarily.

But yourself, chiefly.

Just remember that.

You're not working for me, the president or the company—but yourself.

And on yourself depends the degree of success you attain.

The reason that one man "makes good" in salesmanship where eleven others "fall down" is because the twelfth man always does his best.

And he always does his best because he can not afford to do less—because his self-respect demands it.

That's the whole secret.

All the pull in the world won't bring you anywhere near the results and success that good, honest, hard, enthusiastic work will.

For, say what you like, it's continuous, ceaseless effort that brings success in the world nowadays.

The successful solicitor "makes good" at his work because he prepares himself for every requirement it can call for. He analyses it, root and branch, and has an answer ready for every argument a prospective power user can bring forth. He conquers because he controls.

I remember a certain star solicitor who was noted for getting the business.

As he slammed a pile of contracts down on the manager's desk one day, and got a "great work" from that individual by way of recognition, the tail-ender of the sales force who had been sitting around waiting for business to spruce up, felt a twinge of envy. Finally he buttonholed the star and asked him, "How do you manage to get so many orders, while I can't seem to get any at all?"

"Well," said the other, "I've always made it a point to wear out the soles of my shoes instead of the seat of my pants."

And in that one sentence, fellows, you have the secret of that salesman's success.

He hustled while the other fellow waited.

It will be our endeavor, from week to week, to present in this department brief notices of activities among the central stations, as gathered from men who are in the field and, consequently, in close touch with the progress of the new-business idea and its acceptance by central station managers. Contributions to this department are solicited, and will be received with much appreciation by the editor.

If you are doing something a little better than or different from the other fellows, and think it would make interesting reading to ELECTRICAL REVIEW readers, send in your schemes and plans. They will be gladly received.

Address all communications to Charles A. Parker, care of the ELECTRICAL REVIEW.

Madison, Wis., has the reputation of being a city of electric signs and a place where store, show window and display

Mr. John Corscot, the popular manager of the Madison Gas and Electric Company.

lighting has reached the highest state of perfection. In fact, in these features, it could truthfully be said that Madison is the best-lighted city in the United States.

This is truly a wonderful distinction, and the merchants as well as the Madison Gas and Electric Company have every reason to feel proud of their achievement.

It goes without saying that this central

Mr. J. B. Lindl, manager of the commercial department of the Madison Gas and Electric Company, who is a strong right arm of that company in procuring new business.

station must have been up and doing to have such fame bestowed upon the town in which it is operating, and that it must have reached a high state of commercial success.

Let us look at a few of the causes that operate to bring about the remarkable development of the Madison Gas and Electric Company.

In the first place, the manager, John Corscot, is certainly what the general order of central station managers should be—one of the most, if not the most popular of all men in Madison. Anyone who knows him has no cause to wonder that

Miss J. H. Abbott, employed by the Madison Gas and Electric Company to demonstrate electric heating and cooking appliances, and who won marked success in popularizing electricity in the home and interesting the people in these modern devices.

such is the case, for he is a man of strong character and personal magnetism. He is always genial and has a pleasant word and smile for everybody with whom he comes

in contact—whether the governor of the state or the laborer in the ditch—he has a pleasant word for them all; and is always ready to adjust any grievance they may have against the company or to advise them regarding an installation they may have or contemplate.

The people, and especially the merchants, seem to think that everything Mr. Corscot says is just about right, and his suggestions carry a great deal of weight and are a great source of profit to his company.

Mr. Corscot has been general manager of the company since 1890, and before that time he served the city for twenty-two years in the capacity of city clerk, so you can readily see that he was in a position to become pretty well acquainted, and, you may be sure, he made the best of his opportunity.

His popularity, more than anything else, has made possible the high state of commercial development of the Madison Gas and Electric Company.

A powerfully written booklet on individual motor equipment sent out by the Madison Gas and Electric Company. The text is written with an eye to show the reader exactly how and why electric power is an unusually desirable thing.

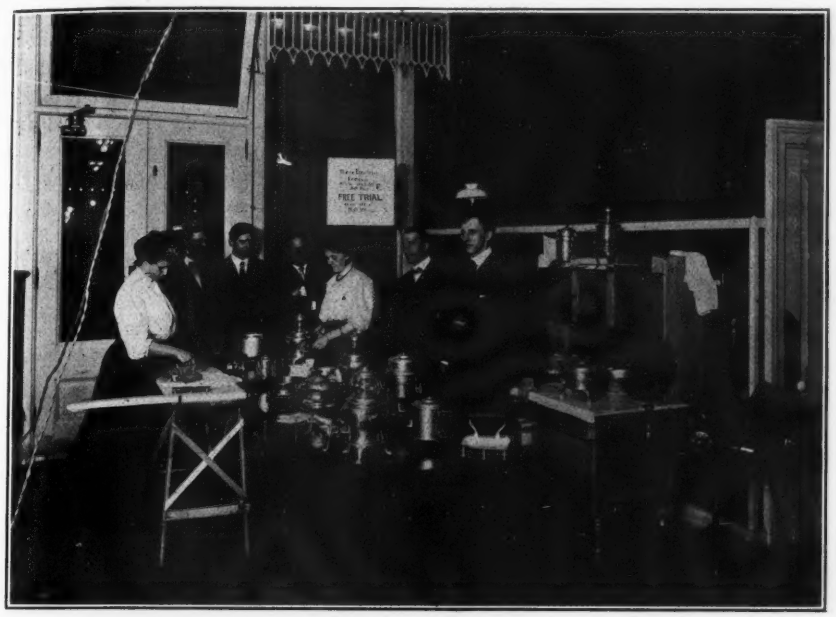
He is a firm advocate of advertising, and believes that all advertising, like all whiskey, is good, but some methods of advertising, like the whiskey, are better than others. Mr. Corscot employs the very best advertising possible to further the sale of electric current.

Another man behind this company who has attributed greatly to the material success of the company is J. B. Lindl, manager of the commercial department. This bright, hustling and aggressive young man first entered the central station field in 1904, being employed by the Eastern Wisconsin Railway and Light Company of Fond du Lac, Wis., as meter reader and collector.

His ambition would not allow him to remain long in the company's employ in this capacity, so he started to educate himself along electrical lines by taking a course in electric lighting with the International Correspondence School.

The company was not slow in recognizing the value of Mr. Lindl, and he was promoted to contract agent one and a half

years later, and in June, 1906, was given full charge of the commercial department of that company. This was a most rapid advancement, but Mr. Lindl showed himself in every way equal to the duties of his office and proved a most valuable and efficient man for the central station.



The demonstrating room of the Madison Gas and Electric Company. The demonstrations this company held on electric cooking and on the different electrical heating devices were a marked success, and productive of direct results.

Seeing a brighter and broader field of usefulness ahead of him, he resigned his position with the Eastern Wisconsin Railway and Light Company in February, 1907, and entered the employ of the Madison Gas and Electric Company, as representative, and after three weeks was promoted to the commercial managership, which position he now holds.

Although things had been progressing at a pretty lively rate with the Madison company, yet when Mr. Lindl arrived the affairs of the company took on a new aspect, new business seemed to flow in more freely than ever before, and the commercial end of the central station was endowed with new life.

To-day the commercial department of the Madison Gas and Electric Company consists of a manager, three representatives and one demonstrator. The city is divided into three districts, one for each representative, and inquiries by telephone or mail are referred to the district solicitors every morning, and after calling on the prospect, the solicitor reports the interview on a comprehensive card.

This card is also used for all straight canvassing, and a file is kept of all reports turned in. This file is gone over every morning, and all call-backs are referred back to the solicitors on the date when due. In this way, all prospects are closely followed up, and much business is secured by the use of this report which would be lost unless call-backs were made on date set by the prospects.

As to methods of advertising, newspapers and direct-by-mail publicity has the preference as a means of bringing results and keeping the gas and electric business before the people.

The management of the company believes that newspaper advertising, to be effective, should be changed often, and has at times embodied in it accounts of what at the time is occupying the minds of the community, interspersed with what it wishes to get before the people.

As to the direct-by-mail advertising, it believes that it is necessary to use only well-gotten-up and tasty literature and mail it to individual addresses of those it wishes to reach, which is far preferable to the "dodger," which, if not carried away

A beautiful little folder, which forms part of the "Sign Service" of the Madison Gas and Electric Company. As a piece of advertising likely to attract attention and make a strong impression, it is a success.

by the wind, is generally consigned to the waste basket or rubbish pile.

The company runs a page advertisement in the leading daily paper and small twenty-inch display advertisements in the city weeklies. It also runs display advertisements on baseball park fences, score cards, university athletic programmes, hotel registers, church-fair and theater programmes and all university and high school publications. These last-named methods of advertising, while beneficial, the company believes are like the souvenir methods of keeping your wares before the public, mainly useful in that you keep in touch with the people and cultivate friendly relations, a feature not to be despised.

Direct-by-mail advertising is employed by sending a regular service or series of facsimile letters, mailing cards, folders and booklets to a selected list of prospects.

The company employs three different services, one for store and store window lighting, one for electric signs and another for electric power. These three services are gotten up for them, printed and mailed out by an advertising company which makes a specialty of syndicate central station advertising.

Each of the three services consist of four very attractive, well-written and good pulling mailing cards, four folders, two booklets and two facsimile typewritten letters with appropriate and handsomely-colored letter heads.

Let us Serve you
We will welcome an opportunity to explain more fully the practical advantages to you of electrical conveniences in the home, store, factory or office.
Let us know about your wants.
It is very likely that we can assist you in putting in new conveniences, or in improving the efficiency of the old.
Our courteous solicitors are always at your service, and their services are free to you.
We want the opportunity to assist you in making our electric service a real benefit to you, and in educating you to its economical and best use.

A few of the inside pages of the truly excellent bulletin of the Asheville (N. C.) Electric Company It is one of the most acceptable pieces of artistic advertising got out by any central station.

This advertising is worthy of the commodity it describes—one can say no more than that. Each and every piece is unique in conception and execution. The text is enticing and usually comprises a complete epitome of convincing reasons for using electric light, electric power, or electric sign, as the case may be.

The excellence and productiveness of the company's advertising can be better appreciated by an analysis of the following new business which was secured since April 1, 1907, at which time the direct-by-mail advertising services from the advertising agency was contracted for:

NEW BUSINESS SECURED DURING APRIL AND MAY, 1907.

207 500-watt flat-irons.
19 1-30-horse-power sewing-machine motors.
2 ¼-horse-power alternating-current motors.
2 ½-horse-power direct-current motors.
1 1-horse-power direct-current motor.
1 2-horse-power direct-current motor.
2 5-horse-power direct-current motors.
1 3-horse-power direct-current motor.
1 7½-horse-power direct-current motor.
3 electric signs aggregating 270 two-candle-power lamps.
10 electric signs averaging twenty to fifty lamps.
120 Nernst glowers, in two, three and six-glower units.
49 new connections equal to 500 sixteen candle-power lamps for residence lighting.

In addition to the above, 309 gas ranges, sixteen water heaters and thirteen hot plates were contracted for by the commercial department.

In order to popularize the use of electric heating and cooking appliances, the com-

pany secured the assistance of Miss J. H. Abbott, whose demonstrations in the use of electricity in the culinary art proved so popular that during the entire week the office of the company was crowded with people who were eager to learn more about the art of electric cooking.

As far as business-getting influence was concerned, Miss Abbott's demonstration was a grand success, as during the week of demonstration orders were taken at the office for seven sewing-machine motors, five washing-machine motors and forty 500-watt flat-irons—which shows that it pays a central station to have some attraction to bring people to the office, where the advantages of electricity can be shown to them in a practical way.

Much depends, however, on the demonstrator, and any central station manager will find himself well repaid in new business for any expense incurred in securing Miss Abbott's assistance. Full particulars about securing such a demonstration can be had by writing to E. L. Callahan, Monadnock Building, Chicago, Ill.

Seeing Asheville, N. C., for the first time one is prone to ask the question, "Why doesn't everybody live here?" It seems as though most everything desirable that nature possesses is centered within this one grand beauty spot.

The central station that is operating in this paradise of the South, the man behind it and the business methods and advertising that he employs in doing his part in placing before the people a commodity that will make life more worth living to the people of Asheville, is something of real interest.

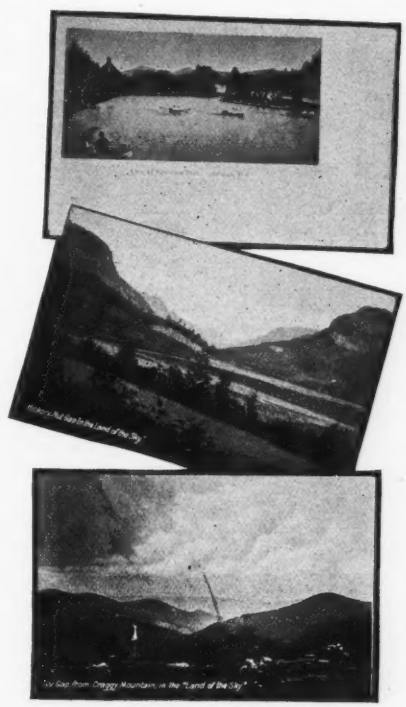
The Asheville Electric Company and its manager, H. W. Plummer, certainly deserve the privilege of doing business in this most favored city. They are truly fine examples of the highest degree of enterprise, activity and aggressiveness.

Mr. Plummer is a clean-cut exception to the popular fallacy that the South is full of men who are unbusinesslike. He is a hustler from his feet up and, so far as business-getting ideas are concerned, might hail from Chicago.

Some years ago he took over a much-run-down gas plant, and has been operating that as well as the electric with considerable success. His electrical business, especially, has enjoyed a most rapid and steady growth, due not only to his personal endeavors, but to the progressive new-business methods and good high-class advertising which he employs and in which he is a firm believer.

The backbone of the Asheville Electric Company's advertising is an excellent "Electric Bulletin" sent out each month, mostly to its customers.

This bulletin is gotten up in magazine form, well printed in two colors, on the best of book paper, and the receiver's immediate attention is attracted by an attractive cover design, each issue having an entirely new design. The bulletin presents the manifold advantages of electricity in such a manner as to create a desire for the improved conditions and conveniences of electricity for all domestic and commercial purposes. Its object is not only to interest prospective customers, but



A few souvenir postal cards of Asheville, N. C. The top card shows a view of the park operated by the Asheville Electric Company, the two lower cards giving an idea of the beautiful scenery and towering hills which surround this southern city. Mr H. W. Plummer, the energetic manager of the Asheville Electric Company, is shown in the bottom card.

nearly every consumer on the company's books receives the bulletin. It realizes that old customers who know the advantages of electricity are easily induced to try heating and cooking and many of the numerous other electrical devices. In this way the company in many cases gets customers to actually double their consumption of current. On the whole, the Asheville Electric Company's bulletin strikes one as a piece of advertising that should attract attention, arouse interest, educate, create a desire, and bring about the resolve on the part of the receiver to buy.

Mr. Plummer believes that the best part about its bulletin advertising is that it assures him that his advertising is reaching the persons intended, which is the greatest problem of a campaign exploiting the sale of current. The name and address on the envelope, and a one-cent stamp in the upper right-hand corner, make Uncle Sam the delivery man, and he sees to it that the bulletin "gets there."

All through this vast country bulletin advertising for central stations is going forth, backing up other means of publicity and the work of solicitors in a way that has never, and can never, be exce by any other form of advertising, except it be a good series of concentrated direct-by-mail advertising.

Bulletin advertising of the class which Mr. Plummer employs reaches its mark and secures its readers for the pure and simple reason that it is a physical impossibility for any one to ignore it.

It might be a benefit to central station men who are interested in this kind of advertising to send a request to the Asheville Electric Company for a sample of its bulletin.

The company is also to be congratulated on its handsome office building and offices. It has in connection with these offices a very nice display or demonstration room in which the public seem to be extremely interested, and which, no doubt, is a great educator and a profitable investment to the company.

In front of the building it has placed a few flaming arc lights, which make its location a conspicuous place during the evening hours.

The company also operates the railway in Asheville and has on its line an up-to-date electric park, from which it derives a considerable revenue in the summer months.

Asheville is a great resort for New York, Boston and Philadelphia people and is well worth a visit.

The Electrical Solicitors' Handbook.

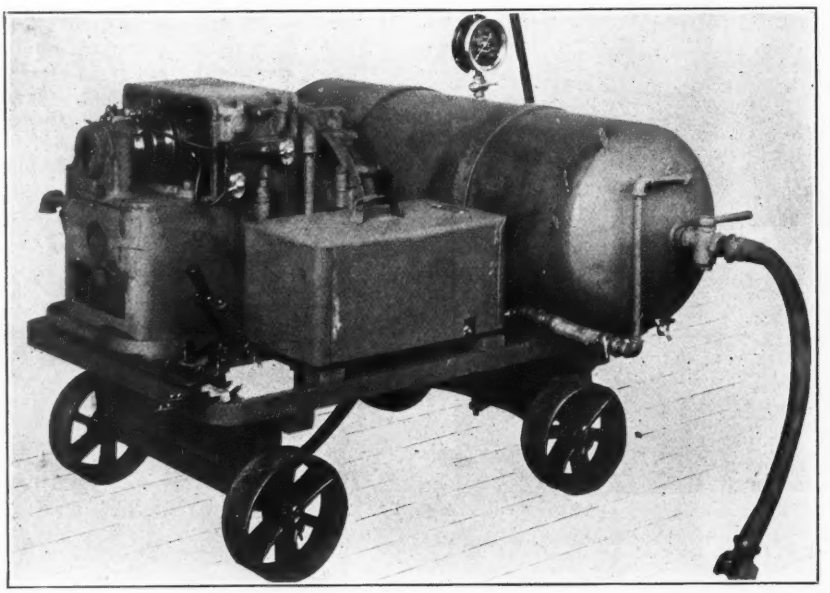
At the convention of the National Electric Light Association, held in Washington, D. C., June 4, 5, 6 and 7, R. S. Hale, Boston, Mass., in reading his paper entitled "The Value and Use of a Solicitors' Handbook," announced a change in plans in connection with the prize contest inaugurated by the Cooperative Electrical Development Association, of Cleveland, Ohio. The association has offered $2,600 in prizes for the best electrical solicitors' handbook. Quite recently the association wrote to all of those who had manifested an interest in the proposed contest, to find out how they felt about an extension of time in which to submit the competing books. By general agreement the time was set for October 1 next, and all of the competitors must have their work turned into the association by that time. The $2,600 has been placed in bank, where it will draw interest until the time the awards are made in October, so that the winners will not only get their prize money, but interest on it as well.

INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

The Christensen Portable Air-Compressor.

The Allis-Chalmers Company, Milwaukee, Wis., has placed on the market the Christensen portable air-compressor, an illustration of which is shown herewith. This equipment consists of a motor-driven compressor, automatic governor, switch and fuse, reservoir, air-guage, short connection pipe, hose and fittings. The entire apparatus is mounted on an ordinary four-wheel platform truck. The compressor is compact in form and is equipped with two cylinders, each provided with a single-acting plunger piston operated by a connecting rod from a drop forged-steel crank shaft set at such an angle as to give the best balance to the moving parts. The crank shaft is extended out at one end to receive a double-helical gear meshing with the pinion of the armature shaft directly above.



THE CHRISTENSEN PORTABLE AIR-COMPRESSOR.

The gear is cut with two keyways, which are placed ninety degrees apart, so that when the teeth of the gear are worn on the sides, corresponding to the greatest pressure on the piston, the gear may be shifted at a corresponding angle on its crank shaft to present another set of teeth, thereby keeping the wear even. The motor base forms a cover for the compressor, and a suitable casing is provided for the gear. The compressor base is filled with oil at the elbow provided for that purpose, and all of the working parts operate in a bath of oil.

The motor operating this compressor, designed for any standard voltage required, is of the series type, the coils being form-wound and thoroughly insulated. It is very carefully built, both mechanically and electrically, and so constructed that the armature and fields may be removed, if necessary, without disturbing any other parts of the machine. This motor can be put in operation or stopped without the use of resistance, simply by closing or breaking the circuit in the same manner as with a knife switch.

An automatic governor starts and stops the motor compressor at the desired minimum and maximum pressures. It is a very simple piece of apparatus, consisting of an ordinary pressure-gauge mechanism with a special hand, which, upon coming in contact with a conducting stud at the position of minimum pressure, allows current to flow through a magnet coil. This coil operates a plunger to which the contact pieces for the motor circuit are attached, thereby closing the circuit and starting the motor.

As soon as the pressure reaches the desired maximum, the hand strikes another stud and current passes through a second solenoid magnet, thereby pulling the plunger in the opposite direction and opening the motor circuit. A magnetic blow-out coil is provided for extinguishing the arc and preventing the burning of the contacts.

The reservoir is of seamless cold-drawn steel, made in one piece, with the bottom pressed in and the end of the reservoir shell beaded over to form a joint, which is afterwards made solid and tight by brazing and tinning. The reservoirs are tested at 300 pounds hydraulic pressure.

These compressors are furnished for capacities of eleven, sixteen, twenty and fifty cubic feet of free air per minute. Each is constructed throughout with sufficient strength to withstand a working pressure of 100 pounds per square inch.

All working parts are readily accessible for inspection.

Shallow Flush Push-Button Switches.

The accompanying illustration (Fig. 1) shows a new type of flush push-button switch placed on the market by the Machen & Mayer Electrical Manufacturing Company, Twelfth and Buttonwood streets, Philadelphia, Pa. These switches are one and seven-sixteenths inches deep, which will allow of their being used in a two-inch partition. They will fit any standard wall box, but when used with the company's shallow box or other standard makes of wall boxes two inches deep, will allow ample space for wiring. This construction

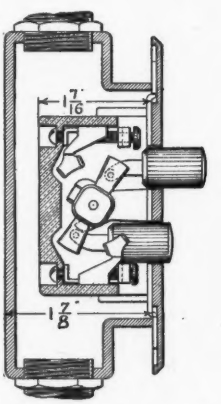


FIG. 1.—NEW TYPE SHALLOW FLUSH PUSH-BUTTON SWITCH.

effects a considerable saving in the cost of installation. The switches are made single and double-pole, double-break, three-way and four-way, and are designed for ten amperes, 250 volts. The company states, however, that they will readily break fifteen amperes 250 volts in the single and double-pole apparatus.

The mechanism is simple and the action positive and reliable. The movement is

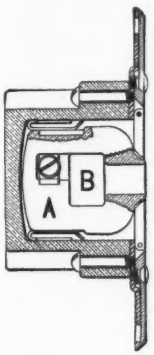


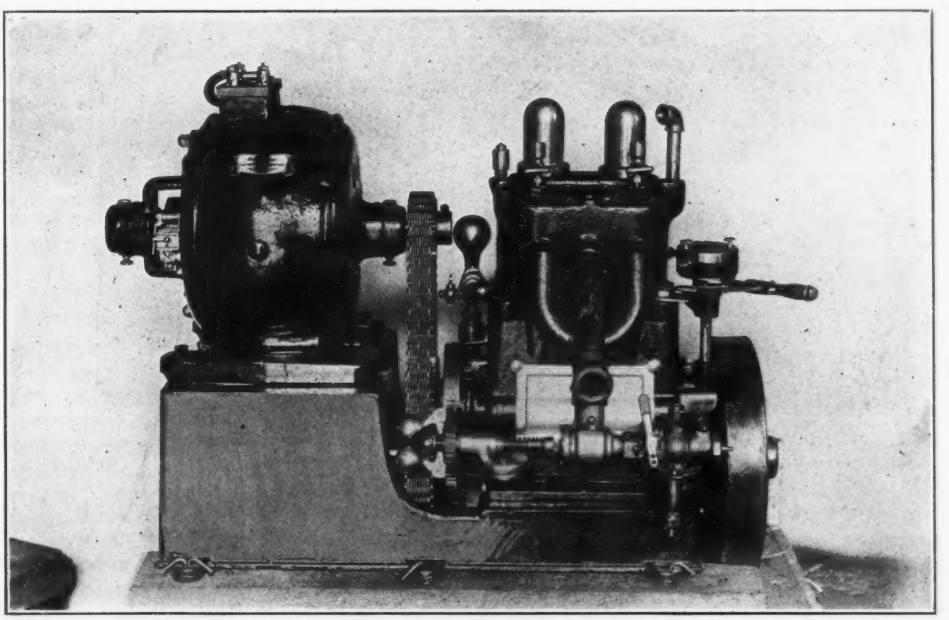
FIG. 2.—NEW SHALLOW FLUSH PLUG RECEPTACLE.

locked until the spring is under tension, when the movement is unlocked, allowing the switch to be thrown with a quick action. The switch blades and contacts have a large overload capacity and are made of phosphor bronze. The insulation is of high-grade sheet mica and the operating spring is of oil-tempered steel. The porcelain base has heavy walls, and all small projections which might have a tendency to chip off have been avoided. The switch movement is mounted on a continuous lug slotted in each end, enabling the switch to be adjusted in line in the wall box when the latter is out of line. The face-plates are of sheet brass.

Fig. 2 shows the new flush-plug receptacle, one and five-eighths inches deep, designed for ten amperes, 250 volts. The receptacle has phosphor-bronze blades riveted to the binding posts, which have turned-up lugs in accordance with the National Board of Fire Underwriters' latest requirements. The porcelain base has very heavy walls. The receptacle will fit any standard box, and the lugs for mounting in the wall boxes have slotted ends to allow of alignment. The plug is strongly built with heavy copper contacts, with turned-up lugs on the binding posts. There is a large hole in the plug to hold a knot in a reinforced lamp cord, and, at the same time, the outlet hole is of such size as to make it impossible to pull out a knot in the ordinary lamp cord. The face-plates are of sheet brass with tight-fitting doors, and will be furnished in any standard finish.

A New Light-Weight Generating Unit.

The Richardson Engineering Company, 36 Pearl street, Hartford, Ct., has placed on the market a compact, light-weight generating unit, an illustration of which is shown herewith. This outfit embodies a new feature, introducing the silent chain drive, enabling the use of a high-speed dynamo and a lower-speed engine, which cuts down the weight and also the vibration. These equipments are built especially for charging automobiles, for isolated plant lighting, for launch and yacht work. At present they are built in two sizes—two horse-power, sixteen inches by thirty-three inches by twenty-four inches high, weighing 370 pounds; and five horse-power, fifty sixteen-candle-power lights capacity, nineteen by thirty-six by thirty inches high, weighing 580 pounds. The driving machine is a two-cylinder, four-cycle gasolene engine, throttle governed, with a jump-spark ignition, and the generator is a standard 110-volt direct-current machine. The circulating water pump is part of the engine, and the whole outfit is mounted on an iron base.



LIGHT-WEIGHT GENERATING UNIT.

The Washington Souvenir of the Curtis Advertising Company.

The Curtis Advertising Company, Detroit, Mich., issued a series of souvenir postal cards at the recent convention of

I was out with the Alice Charmer bunch.
The President was Delighted to see me
I'm having A Capital Time
A Washington type of brush holder

SOUVENIR POSTAL CARDS DISTRIBUTED AT THE WASHINGTON CONVENTION OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

the National Electric Light Association, held at Washington, D. C. These cards, which are reproduced herewith, were the subject of a great deal of favorable comment, and were sent out in large numbers by the members and guests. Another clever piece of advertising which the Curtis Advertising Company issued was in the

form of a summons got up in strictly legal style, commanding the delegates to appear at the company's booth.

During the convention the members of this company were kept busy entertaining and interviewing friends, customers and prospects among the central station fraternity, and in the ranks of the manufacturers and supply men. The company's representatives at the convention were Fred A. Curtis, president; C. H. Johnson, vice-president; Charles A. Parker, secretary, and Fred C. Mathews, assistant general manager.

The Para Wire Works.

It is generally understood that the Para Wire Works, New York city, expects to break ground for its factory about August 1 of this year. The factory will probably be located in the western part of New York, and will be a most modern and up-to-date plant. The company will manufacture rubber-insulated copper wire of a high grade, under National Electric Code standards. Agents are now being appointed for different territory throughout the United States. The product, it is believed, will be on the market about the first of next year. By that time the company hopes to have its wire approved by the Underwriters.

Temporary offices have been established at 97 Warren street, New York city. The executive work of the organization and its incorporation are in the hands of Francis Granger, who is well known in the electrical field, having been prominently connected, among other companies, with the Sterling Electrical Manufacturing Company and the Waterbury Company.

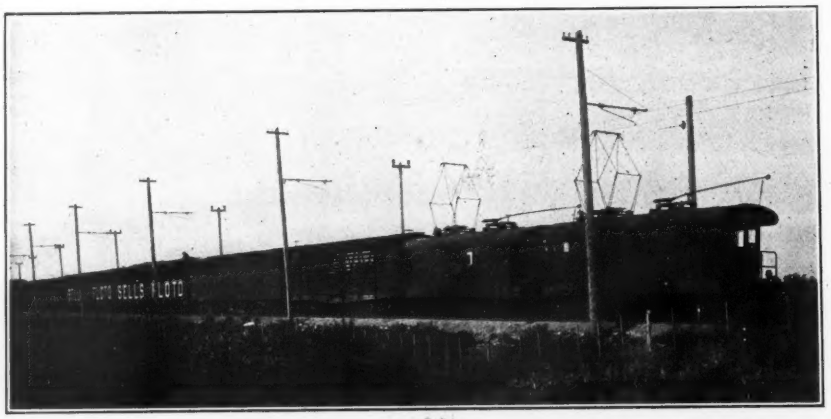
Electrically Heated Glue Pot.

The accompanying illustration shows a new electrically heated glue pot made by the W. J. Barr Electric Manufacturing Company, Cleveland, Ohio. This pot is made of cast aluminum, is very light in weight, the glue does not adhere or crystallize on the edges and the pot is made without a water-jacket, cutting down the consumption of current. The heating element is easily accessible, readily interchangeable, and so constructed that at no time does the heat endanger the consistency or integrity of the glue.

Electrically Heated Glue Pot.

Heavy Hauling on the Inland Empire System.

The accompanying illustration has been reproduced from a photograph taken on June 9 of the Sells-Floto circus train, which was hauled over the Spokane & Inland division of the Inland Empire System from Palouse, Whitman County, to Spokane, Wash., a distance of seventy-six miles. This is the first instance of a circus being transported by electric power in the Northwest. The outfit consisted of five sixty-foot Pullman coaches, seven standard stock cars and eleven sixty-foot flats, aggregating 2,300 tons. The Spokane & Inland division is equipped with the Westinghouse single-phase system, fifty-ton, 600-horse-power Westinghouse locomotives being used for heavy hauling.



Heavy Freight Service on the Spokane & Inland Division of the Inland Empire System.

American Telephone and Telegraph Company.

(From the *Wall Street Journal*)

Boston—A stockholder of the American Telephone and Telegraph Company wrote to President Vail some weeks ago concerning the future financing of the company, and has just received the following letter:

An answer to your communication of recent date has been delayed that facts and figures on which to base the same could be collected and revised.

Revised estimates have been obtained from all the companies comprising the so-called Bell system, based on the necessary requirements for the current year. These estimates cover all the work necessary in the way of extensions and increase in subscribers' stations for a healthy and continued growth in expansion, meeting all reasonable demands.

The existing liabilities and resources have also been considered, and the demands on the American Telephone and Telegraph Company determined. Allotments for expenditures for the companies have been agreed upon for the year, based upon the estimates and resources above named.

It is now safe to state that, after providing for all the existing and anticipated demands for the current year, the American Telephone and Telegraph Company will commence the year 1908 with no floating indebtedness and with a very substantial cash balance.

This does not in any way take into account the money received for the share capital of the American Telephone and Telegraph Company, now being issued, which will, under normal conditions, make it possible for the company to go through to January 1, 1909, without further financing of any kind.

Very truly yours,
Theo. N. Vail, President.

Boston—A leading official of the American Telephone and Telegraph Company says: "Actual returns show that there were installed 131,922 subscribers' stations in the first four months of 1907, as against 169,668 during the first four months of last year, while estimates of expenditures provide for the installation of over 472,000 subscribers' stations this year, as against 485,000 installed last year.

"Last year a very active and energetic canvass and solicitation was made. This year all the soliciting has been confined to getting a higher class of business or changing from a lower to a higher class, all with greater profit to the companies."

Current Electrical News

DOMESTIC AND EXPORT.

NEW SOUTH AMERICAN TELEGRAPH CONCESSION—Advices from Buenos Aires, dated June 10, state that a concession to build a new line between Buenos Aires and Mendoza and a new line concession has been obtained by the Central and South American Telegraph Company.

LIMA & TOLEDO FILES BIG MORTGAGE—A mortgage for $2,500,000 has been filed by the Lima & Toledo Traction Company, with the Provident Life and Trust Company, of Philadelphia, as trustee. The mortgage covers all of the company's Indiana and Ohio property and the money, it is stated, is for the purpose of taking up the outstanding indebtedness and to pay for extensions and improvements.

MONTREAL LIGHT, HEAT AND POWER COMPANY ANNUAL REPORT—The annual report of the Montreal Light, Heat and Power Company for the fiscal year ended April 30 shows gross earnings of $3,453,490, an increase of $267,388. The operating expenses were $1,529,270, an increase of $98,073. The interest on bonds and insurance were $483,638, which, added to $850,000 for dividends at five per cent, leaves a surplus of $590,582. The report states that during the year bonds to the amount of $447,000, bearing four and one-half per cent interest, were issued to repay the company seventy-five per cent of the expenditure made during the year for extensions in the gas and electric departments. Owing to the depressed condition of the bond market throughout the year, the sale of these bonds has been withheld, and they are at present in the treasury.

THE JOPLIN & PITTSBURG RAILROAD—The Joplin & Pittsburg Railroad Company, of Kansas City, Mo., was chartered at Jefferson City, Mo., on June 10, by the secretary of state, John E. Swanger. The company has a capital stock of $5,000,000 and is incorporated to build and operate interurban electric lines in Jasper and Newton counties in Missouri and in Crawford, Cherokee and Labette counties in Kansas. This is to consolidate with the Pittsburg line now in operation and a new line to be built from Joplin to connect with it. The line is a Heim road. Joseph J. Heim is the president and John A. Prescott is the secretary. The directors are: Joseph J. Heim, John A. Prescott, of Kansas City; Fred H. Fitch, Pittsburg; John W. Ground, Carthage; W. W. Calhoun, of Carthage; T. K. Irwin, of Carthage; D. L. Robertson, of Buffalo, N. Y.; R. E. Richardson, of Kansas City; E. C. Wright, of Kansas City; C. G. Hutchinson, of Kansas City. The stock is divided into 50,000 shares of $100 each, and each of the above directors holds ten shares while George W. Carpenter, of Kansas City, holds 49,890 shares.

METROPOLITAN HOME TELEPHONE COMPANY ORGANIZED—At a meeting of the stockholders of the Metropolitan Home Telephone Company, on June 10, a permanent organization was formed and Colonel Albert Clarke, secretary of the Home Market Club, was elected president. The other officers elected were: Albert L. Ireland, president of the William S. Hills Company, vice-president; James G. Ferguson, president of the J. G. and B. S. Ferguson Company, treasurer, and Roger E. Miley, for many years assistant manager of the W. K. Fairbanks Company, secretary. The directors elected were: Colonel Clarke, Mr. Ireland, Mr. Ferguson, Mr. Miley, John T. Connor, Bernard M. Wolf and Horace Bacon. This is the company which holds the telephone franchise recently granted by the Board of Aldermen over Mayor Fitzgerald's veto, and which proposes, with a capitalization of $10,000,000, to build an independent telephone system in Boston and vicinity. Telegraph advices from Detroit, Mich., dated June 14, state that the company was purchased by Max Koehler, of Detroit, two months ago. Several of the Boston stockholders state that they are unaware of this purchase.

MEXICAN ELECTRICAL NOTES—The Mexican City Electric Tramways Company, Limited, has entered into a contract with the secretary of public communications and works, by which the company cedes the Calzada de los Insurgentes to the federal government under certain conditions, the principal of which is that the company reserves the right to maintain two tramway lines, each with three rails, in the street, and the government expressly agrees not to grant any concession of any kind to any other concern. The company is released from all obligations as to the pavement and drainage of the calzada. The contract provides for all the requirements of the company in the construction and conservation of its three-railed lines, and its duration is until February 24, 1982. At the expiration of this term, the government may acquire the company's lines and all accessories, paying the price determined by two experts, one named by each party. The Calzada de los Insurgentes is in the vicinity of the Café Colon, where the primitive company of Ramon Guzman and Angel Lerdo had the first station grounds, and were of considerable extent, over thirty years ago. According to reports current in Guadalajara, plans are being made for an electric light and power company to compete with the Compañia de Tranvias, Luz y Fuerza de Guadalajara, the $11,000,000 concern which secured control of the local field by the merger of La Electra and the Compañia Industrial de Guadalajara. The company is projected, it is said, in connection with the concession on the Santiago river held by Manuel Cuesta Gallardo, of Guadalajara. The Cuesta concession covers several kilometers of the river, and is regarded as very valuable. It is estimated that current to the extent of at least 20,000 horse-power can be generated. Mr. Cuesta is one of the men principally interested in the plans for the new company. It is reported that a number of subscriptions for stock have been already pledged. A circular issued by the Compañia de Tranvias, Luz y Fuerza de Guadalajara announces that the administration of the affairs of that company is vested in a board composed of the following persons: Andres Bermejillo, Fernando Pimentel y Fagoaga, Luis Barroso Arias, Hugo Scherer, Jr., Enrique Pazos, Martin G. Ribon, Emilio Pinzon, Ceyetano Valadez and Tomas Torres. With the exception of Mr. Torres, all members of the board are residents of Mexico City. Mr. Torres is general manager of the company with headquarters in Guadalajara.

ELECTRIC LIGHTING.

NEWPORT, N. Y.—George T. Woodin and A. H. Watkins have purchased the local electric light and power plant.

CLAYTON, N. J.—The electric light contract has been awarded to Moore Brothers for a period of five years beginning August 15.

HAVANA, ILL.—E. H. Parker, a prominent resident of Kilbourne, will in the near future establish an electric light plant there.

CANANDAIGUA, N. Y.—The Ontario Light and Traction Company will put its local plant in first-class condition, at an expense of about $30,000.

MILFORD CENTER, OHIO—The municipal electric light and water plants will be sold at auction, their operation not having proved successful.

AUSTIN, TEX.—The Dallas Electric Light and Power Company has filed an amendment to its charter increasing its capital from $700,000 to $1,400,000.

ROME, N. Y.—The Rome Gas, Electric Light and Power Company has been awarded the street lighting contract for three years, at $90 per lamp per year.

MARLBORO, MASS.—The Marlboro Electric Company has changed hands. Walter G. Webber has been chosen president, and William H. Emory, treasurer.

HEMPSTEAD, TEX.—J. C. Amsler has been granted a permit by the board of county commissioners to set poles throughout the

city in connection with an electric light plant to be installed by a proposed company in which Mr. Amsler is interested.

FRANKLIN, LA.—The contract for the new machinery and equipment for the electric light plant has been let to Muralt & Company, of New York, for $28,000.

OMAHA, NEB.—The Omaha Electric Light and Power Company has agreed to a reduction of twenty per cent in its commercial lighting rates, to take effect September 1.

AKRON, N. Y.—A franchise has been granted by the town board to the Genesee County Light, Fuel and Gas Company to construct a transmission line across the highways of the town.

CHEWELAH, WASH.—At a special election it was voted to expend $14,000 for electric light and water systems. The electric light plant is to be ready for operation by October.

WILMINGTON, DEL.—The directors of the street and sewer department have passed over the veto of Mayor Wilson, the franchise of the Commercial Light, Heat and Power Company.

ATLANTA, GA.—The Atlanta, Birmingham & Atlantic Railroad has announced its purpose of erecting an electric lighting plant at Brunswick in connection with its terminals at that place.

GREENSBORO, N. C.—The Greensboro Electric Company, recently purchased by W. T. Van Brunt and associates, of New York, has been granted an extension of franchise for fifty years from October, 1909.

LA CROSSE, WIS.—The La Crosse Water Power Company expects to have its plant at Hatfield completed and all connections made so that power may be furnished in La Crosse on or about December 1.

SCRANTON, PA.—The American Gas and Electric Company has ordered four 600-horse-power boilers and two 2,000-horse-power steam turbines for the addition to its power plant on North Washington avenue.

TAUNTON, MASS.—A grant allowing the New Bedford Gas and Edison Light Company to locate poles for electric lights in the streets of Mattapoisett and to string the necessary wires has been made by the selectmen.

SOUDERTON, PA.—The municipal lighting plant here having proved, after several years' experience, a decided failure, the borough has made a contract with a private company to supply the necessary current for the system.

MARION, IND.—For the consideration of $24,000 the firm of LaRue & Patterson, which has owned and operated the Fairmount light and power plant for five years, has sold the property to the Central Indiana Lighting Company.

LEBANON, TENN.—The municipal electric light plant is to be enlarged and improved. A new 500-horse-power engine will be installed, making the capacity of the plant 650 horse-power. The work is to be completed by September 1.

PROVIDENCE, R. I.—The Narragansett Electric Lighting Company has put into operation the reduced rates to users in the vicinity of Providence which amount to practically twelve and one-half per cent less than those heretofore charged.

REDDING, CAL.—The Shasta Power Company, commonly known as the Shannon company, and which has already erected its substation in Redding and is now wiring this city, has commenced action to condemn 3,000 inches of water from Hat creek for public uses.

INWOOD, L. I.—Inwood is soon to have gas and electric lights, a sufficient number of applications for the same having been received by the Queens Borough Gas and Electric Company. The work of laying the mains and stretching wires for the service is now being done.

DUBUQUE, IOWA—The Union Electric Company, operating the Dubuque Light and Traction property, has amended its articles of incorporation increasing the capital stock from $1,000,000 to $1,500,000. Extensive improvements and betterment of facilities are given as reason for the increase.

EGG HARBOR CITY, N. J.—The Atlantic County Electric Company has been granted a five-year contract to light the streets of this city with arc lights at $2,221.60 per year, from sundown until one o'clock. The price includes twenty-eight arc lamps and twenty incandescent lights of thirty-two candle-power each.

LIBERTY, N. Y.—An electric franchise has been granted by the village of Liberty to the Ulster Electric Company, of Ellenville. The franchise stipulates that the company shall not charge more than fourteen cents per kilowatt-hour, and that street lights shall be furnished at seventy-five cents per month per light.

FRANKFORT, KY.—The Court of Appeals in affirming the case of R. W. Overall *vs.* the city of Madisonville holds that the city has power to erect and operate a lighting and water plant. Overall is a taxpayer of Madisonville and sued to prevent the city of Madisonville from constructing and owning a light and water plant.

GRANVILLE, N. Y.—The Salem Heat, Light and Power Company, which filed papers with the secretary of state a few months ago for the purpose of furnishing electric energy for the village of Salem, has begun the installation of a power-house at East Greenwich, on the Battenkill, some four miles south of Salem village.

CALHOUN, GA.—An election has been called by the mayor and aldermen of Calhoun for July 8, when the citizens of the town will vote for or against a bond issue of $12,500 for putting in an electric lighting plant to cost $11,500, and $1,000 for extending and improving the water-works system now in operation in the town.

TACOMA, WASH.—E. W. Commings, of Seattle, has made an offer to the city council to build a water power plant which will develop 10,000 horse-power for $75,000. The plant is to be located on the Puyallup river, near Electron, and Mr. Commings' proposition provides that Tacoma shall buy the site and the right of way to the city.

COLUSA, CAL.—The county board of supervisors of Colusa county has accepted the bonds and granted the application of Charles Glen, A. S. Lindstrom and C. R. Wickes for a franchise to erect poles and string wires for the transmitting of heat and power in Colusa county. The new company intends getting power from Stony creek.

MORRISTOWN, N. J.—The Morris & Somerset Electric Company has been organized with Frank L. Humphreys, John M. Forbes, S. H. Gillespie and Peter V. Stryker as incorporators. The capital stock is $500,000. The company plans to do a lighting business in and near Morristown and has applied to that city for a franchise in place of that asked by Mr. Stryker individually.

ALBANY, N. Y.—The Newburgh Light, Heat and Power Company, of Newburgh, has applied to the State Gas Commission for authority to issue $250,000 preferred stock. The capital of the company is $500,000 and it has a funded debt of $550,000. It supplies electricity in Newburgh, the town of New Windsor, Orange county, and the town of Marlboro, Ulster county.

KITTANNING, PA.—James McCullough, Jr., F. A. Mesta, John A. Fox, C. J. Mesta and H. E. Mesta have purchased the plant of the Kittanning Electric Light Company for $25,000. These men virtually own the Kittanning & Ford Street Railway Company and by the terms of the purchase secure rights of way for an extension of their road to Mosgrove, five miles north of here.

NEW ORLEANS, LA.—It is learned that the affairs of the old Baton Rouge Electric and Gas Company will be wound up and the Baton Rouge Electric Company, organized with a capital stock of $750,000, will carry forward the business and franchises of the old company. The new company is organized for the purpose of facilitating the improvements that are contemplated.

ATLANTA, GA.—A new electric light and gas company has been chartered by the Superior Court. It is the General Electric and Improvement Company, formed by E. D. Thomas and M. M. Anderson. In addition to carrying on a general real estate, improvement and development company, the power is also conferred to manufacture and sell electric power and light as well as gas.

CALUMET, MICH.—The Menominee Range Power and Development Company, of Iron River, has filed articles of incorporation with the secretary of state. The company has a capital stock of $200,000, and has a franchise to light Iron River. It is the intention of the

company to improve the water powers in the vicinity of the town, which is a centre of noteworthy iron mining development.

AMERICUS, GA.—Ground will be broken shortly for the $150,000 electric power plant to be located here for the city's waterworks and lighting station, and in connection therewith will be built an electric street railway four miles long. The railway, under terms of contract between the city and construction company, will be extended as rapidly as business demands until a complete system is established.

FRANKFORT, KY.—The Court of Appeals, by Judge Nunn, has affirmed the decision of the Jefferson Circuit Court in the case of John Stites *vs.* Charles B. Norton. The action was instituted by Stites, a taxpayer, against the board of public works, to enjoin the selling of a franchise for the sale of electricity. The sale was made to Lawrence Jones, of the Kentucky Electric Company, for $100,150, and it was sought to have it nullified.

SALISBURY, MD.—A deal has been effected here by which the Salisbury Light, Heat and Power Company passes from the control of Philadelphia capitalists to local holders. The entire plant was purchased a few years ago for $41,000, and shortly afterward was bonded for $67,000. It is understood that the purchasers here include the following: Uriah W. Dickerson, William J. Downing, Marion V. Brewington, Charles R. Disharoon, Samuel A. Graham and John H. Tomlinson.

NEWNAN, GA.—Following the recent issue of bonds by the city of Newnan for the erection of a new electric light plant the light and water commission has awarded contracts as follows: Dynamos to the Crocker-Wheeler Company, of Ampere, N. J.; engines to Harrisburg Foundry Company, Harrisburg, Pa., and switchboard to the Fort Wayne Electric Works, Fort Wayne, Ind. The three contracts will aggregate about $15,000. The power station, for which contract has not yet been awarded, will be a modern fireproof building.

AUBURN, N. Y.—There has been filed with the county clerk a certificate of an extension of the corporate powers of the Auburn Light, Heat and Power Company. The extension is set forth in the certificate as being for the purpose of manufacturing and supplying gas and electricity and the purchase, acquiring and holding and disposing of the stocks, bonds and other evidences of indebtedness of any corporation, foreign or domestic, and issuing in exchange therefor its stocks, bonds and other obligations. It is supposed that this has been done in order to pay for the stock of the Citizens' Light and Power Company, recently purchased with stock of the Auburn Light, Heat and Power Company.

ANDERSON, IND.—The Central Indiana Lighting Company, a branch of the National Heat, Light and Power Company, of New York, has acquired the plant of the Alexandria Electric Light and Power Company at Alexandria. The sale to the syndicate took place while a sale by the receiver, the Anderson Trust Company, of this city, was pending. The Superior Court deferred the sale by receiver and the Central Lighting Company finally acquired the bonds of the Alexandria company in receivership and then assumed other obligations that made a total consideration of between $50,000 and $60,000. The new owner will take charge of it at once and make considerable improvement. The purchase of the Alexandria plant will be followed, it is thought, by the Central company's acquiring the electric light plants at Summitville and Elwood.

DATES AHEAD.

Jamestown Tercentennial Exposition. Norfolk, Va., April 26 to November 30.

Society for the Promotion of Engineering Education. Case School of Applied Science, Cleveland, Ohio, July 1-3.

National Electrical Contractors' Association. Annual meeting, New York city, July 17-19.

Illuminating Engineering Society. Annual meeting, Boston, Mass., July 30-31.

International Association of Municipal Electricians. Norfolk, Va., August 20-22.

Ohio Electric Light Association. Annual meeting, Toledo, Ohio, August 20-22.

Canadian Electrical Association. Annual convention, Montreal, Quebec, September 11-13.

Railway Signal Association. Annual meeting, Milwaukee, Wis., October 8-10.

ELECTRICAL SECURITIES.

The dullness which has characterized the stock market for some time was continued last week, with transactions on Thursday, June 20, reaching, in point of numbers, the lowest level for the year. The present period is surely one of marking time and the readiness with which small blocks of stock are taken up has had a tendency to check any further unloading with a view of further depressing prices. In other words, it is hardly likely that much liquidation will be indulged in, as those who own stock outright are willing to keep it, now that ideal weather conditions obtain throughout the country and ambition has leaped again into renewed life, while those who unload to buy again at a lower figure are finding it difficult to keep the prices down, so that there has been outright loss in a number of such transactions lately. The pessimistic utterance of Mr. Vanderlip, as the voice of the national bankers, as to what might result if Governmental action is unsatisfactory to the moneyed interests, is overshadowed by his prophecy as to what glories can be accomplished if a sane and logical viewpoint is taken of the situation, to which viewpoint, it is safe to say, the American public, by reason of its enlightenment and experiences, will turn its gaze in good and sufficient season.

ELECTRICAL SECURITIES FOR THE WEEK ENDING JUNE 22.

New York:	*Closing.*
Allis-Chalmers common	9½
Allis-Chalmers preferred	27
Brooklyn Rapid Transit	53½
Consolidated Gas	117
General Electric	135¾
Interborough-Metropolitan common	16¼
Interborough-Metropolitan preferred	44⅜
Kings County Electric	121
Mackay Companies (Postal Telegraph and Cables) common	65¼
Mackay Companies (Postal Telegraph and Cables) preferred	64
Manhattan Elevated	130
Metropolitan Street Railway	85
New York & New Jersey Telephone	112
Western Union	77½
Westinghouse Manufacturing Company	143¼

The adjourned annual meeting of the Consolidated Gas Company has again been adjourned until July 30.

A quarterly dividend of 2½ per cent upon the preferred, assenting and non-assenting stocks of the Westinghouse Electric and Manufacturing Company, has been declared payable July 10 to stockholders of record June 28. Transfer books will be closed from June 28 to July 11.

Boston:	*Closing.*
American Telephone and Telegraph (ex-dividend)	104
Edison Electric Illuminating	205
Massachusetts Electric	55
New England Telephone	110
Western Telephone and Telegraph preferred	70

Philadelphia:	*Closing.*
Electric Company of America	9½
Electric Storage Battery common	50
Electric Storage Battery preferred	50
Philadelphia Electric	8
Philadelphia Rapid Transit	23
United Gas Improvement	92¾

The directors of the Electric Storage Battery Company have declared a dividend of 1¼ per cent from the net earnings of the company, on both common and preferred stocks, payable July 1 to stockholders of record at the close of business on June 25.

Chicago:	*Closing.*
Chicago Telephone	125
Chicago Edison Light	138
Metropolitan Elevated preferred	62½
National Carbon common	71
National Carbon preferred	110
Union Traction common	—
Union Traction preferred	—

ELECTRIC RAILWAYS.

EVANSVILLE, IND.—The Evansville & Eastern Traction Line, running from here to Rockport, Ind., was opened on June 6.

TONOPAH, NEV.—An electric railway franchise has been granted to Arthur Raycraft, Key Pittman, L. R. Scott and associates.

SARATOGA SPRINGS, N. Y.—The Delaware & Hudson Company has been granted a franchise to operate an electric line in Saratoga Springs.

UTICA, N. Y.—The Utica Southern Railway Company has received the consent of property owners in Norwich and Sherburne for the construction of the new electric railway.

TAYLORVILLE, ILL.—At a meeting of the board of directors of the Springfield & Southeastern Traction Company in Springfield the contract with J. W. Beardsley, of Texas, for the construction of the road was ratified.

SAYRE, PA.—The town board of Chemung has granted a franchise to the Elmira, Corning & Waverly Railroad to lay its tracks on the highways of that town. The company has also been granted a franchise in Corning, N. Y.

PROVIDENCE, R. I.—Contracts have been awarded by the Rhode Island Company for the erection of two power-houses, one on Pawtucket avenue in East Providence and the other at Limerock, on the Woonsocket line.

BETHLEHEM, PA.—The South Bethlehem & Saucon Street Railway Company, which intends to build a trolley road from South Bethlehem to Centre Valley, has begun work. It is expected to have the line in operation next fall.

ENID, OKLA.—A company composed of seventy citizens of Enid has been organized to build an interurban electric line between Enid and Tonkawa, passing through Garber, Billings and Blackwell. Blackwell has already signified a desire to contribute $15,000 to such a proposition.

NORRISTOWN, PA.—The Montgomery Traction Company will construct a trolley road between this town and Ambler, a distance of ten miles, with a possible continuation through to Willow Grove. The proposed route will be from Centre Springs to Blue Bell, to Broad Axe and then to Ambler.

LEBANON, ILL.—The Carlyle & St. Louis Electric Railway will let construction contracts soon. The line will extend from Carlyle to Lebanon and will be twenty-three miles long. The company has been incorporated in Illinois as an extension of the East St. Louis & Suburban Railroad Company.

MALONE, N. Y.—The Paul Smith Company has been granted a franchise to build and operate an electric road in the streets of Saranac Lake village. The franchise runs for fifty years, and Mr. Smith and his associates will pay the village $25,000 for the franchise and privileges granted thereunder.

BELLINGHAM, WASH.—A deal involving more than $1,000,000 and the construction of an electric railway system from Tacoma to Vancouver, B. C., has been closed by Stone & Webster, of Boston, purchasing the franchises of the Everett Electric Company. This transfer insures the long-talked-of Tacoma-Vancouver line.

SPOKANE, WASH.—Seattle capitalists, represented by George W. Gregory, a local attorney, are planning the installation of an electric power plant and a water system at Centralia and an electric railroad system connecting Centralia and Chehalis. Attorney Gregory has asked the Centralia city council for a franchise for the railroad.

ROCHESTER, N. Y.—The Rochester, Scottsville & Caledonia Electric Railroad has certified to the secretary of state an extension of its line from the present westerly terminus of the road to Le Roy, Stafford and Batavia, a distance of sixteen miles. The certificate is signed by Isaac W. Salyerds, as president, and Merton E. Lewis, secretary.

MERIDIAN, MISS.—Stockholders of the Meridian Light and Railway Company have instructed their counsel to advertise an amendment in their charter authorizing an increase in capital stock from $1,000,000 to $2,000,000. The purpose in doubling the capitalization is to provide means for further expansion of the street railway system and lighting plant.

SPOKANE, WASH.—Simultaneous with the inauguration of the summer train schedule on the Cœur d'Alene division of the Inland Empire system the new extension of the line to Liberty Lake has been opened. The Cœur d'Alene division has forty-two miles of track, the extension from Liberty Lake junction on the main line to the lake being a fraction over two miles.

BOSTON, MASS.—A petition has been filed with the board of railroad commissioners asking for the approval of the consolidation of the Springfield Street Railway and the Western Massachusetts Railway companies. Both companies are owned by the New York, New Haven & Hartford Railroad, the petitioner being in each case President C. S. Mellen of the road.

NEW HAVEN, CT.—Announcement is made that the Providence & Burrillville and the Columbian and Woonsocket street railway companies are to be merged with and become a corporate part of the Rhode Island company. The latter is the holding company which operates the street railway properties in Rhode Island controlled by the New York, New Haven & Hartford Railroad.

TAYLORVILLE, N. Y.—The by-laws of the Prairie State Traction Company, which purposes to build an interurban railroad from Roodhouse to Pana through Taylorville, have been filed. The capital stock is $6,000, nominal. H. C. Morrow, of Springfield, is president of the road, and Scott Etter, of Palmyra, is general superintendent.

COLUMBIA, TENN.—A mortgage has been filed here by the Nashville Interurban to the Trust Company of America for the issuance of $1,500,000 thirty-year five per cent construction bonds, with gold-bearing interest, payable semi-annually. Twelve deeds of rights of way between Columbia and Mt. Pleasant have also been filed in the register's office.

BALTIMORE, MD.—At the annual meeting of the Maryland Electric Railways Company the following directors were elected: John Wilson Brown, Shellman Brown, Daniel R. Randall, Frank S. Hambleton, Joseph C. France, Edwin G. Baetjer and J. Winfield Henry. Mr. Henry is the only new member of the board, succeeding Harman B. Bell, who declined reelection.

LANSING, MICH.—An electric railway company, organized with $1,500,000 capital to construct a road from a point near South Camden on the state line in Hillsdale county, to Hillsdale, Coldwater and Kalamazoo, has filed its articles of incorporation with the secretary of state. The stockholders are Pittsburg and Toledo men who are interested in the construction of a connecting line in Ohio to run to Toledo.

SLATINGTON, PA.—Surveyors have completed work for the route of the Franklin & Tonamensin Street Railway, between Slatington and Lehighton, a distance of nine miles. When this link is built it will be possible to travel by trolley from Philadelphia to Scranton, 200 miles. The proposed road will connect at Slatington with the lines of the Lehigh Valley Transit Company and at Lehighton with the Flagstaff road.

ALBANY, N. Y.—The Rochester, Syracuse & Eastern Railroad Company has received authority from the state railroad commission to increase its common stock from $3,500,000 to $6,000,000. The total capital stock of the company, common and preferred, amounts, with the increase, to $8,500,000. The company is operating a double-track electric line from Rochester to Lyons, and is to extend its road to Port Byron and thence on to Syracuse.

PHOENIXVILLE, PA.—Burgess Thomas A. Evans has signed the ordinance granting permission to the Philadelphia Interurban Electric Railway Company to build and operate a trolley road within the borough limits. The ordinance calls for a completed road with cars running on schedule time inside of two years. Rights of way have been secured between Pottstown and Phoenixville, and work on the new line will begin immediately.

CANON CITY, COL.—The bonus of nearly $25,000 subscribed by the citizens of this place to be paid to Frank D. Heath, promoter of the proposed electric street railway on the completion of the system, has been ordered returned to the subscribers by the

committee having it in charge. Heath and J. H. Peabody can not complete the road within the required time to claim the bonus. The project, however, has not been abandoned.

REDLANDS, CAL.—The Redlands & Yucaipe Electric Railway Company has authorized the issuance of bonds to the amount of $50,000 for building and equipping its nineteen miles of trolley road from Redlands through the Yucaipe valley to Oak Glen Heights. The bonds, which will be financed by the Los Angeles Title and Trust Company, will be of the denomination of $1,000 each and bear five per cent interest payable semi-annually.

NEW ALBANY, IND.—The Louisville & Northern Railway and Light Company, which recently completed a preliminary survey for an electric line from this city to French Lick and West Baden Springs by way of Paoli, has placed a corps of surveyors at work to locate the road. When this is completed contracts for construction will be awarded. The proposed road is fifty miles long and traverses the most thickly populated portion of southern Indiana.

SPRINGFIELD, ILL.—The secretary of state has authorized the incorporation of the Paris & Northern Traction Company, with headquarters at Paris. The object of the corporation is to construct an interurban railway from Paris through the counties of Edgar and Vermilion to Ridge Farm and Brocton. The incorporators and first board of directors are P. L. Kidder, L. L. Canine, John J. Cummings and John E. Parish, of Paris, and George E. Fair, of Chrisman.

McEWEN, TENN.—A party of capitalists from Indiana have been looking over the ground for a trolley line from Ruskin to some point on the railroad and have concluded that from that place to McEwen would be the best and cheapest route. They propose to take $75,000 of the stock if the people along the line will take the other $25,000. It is also thought that the line may be extended from Ruskin to the Cumberland river and from McEwen to the Tennessee.

BUFFALO, N. Y.—The Buffalo & Lake Erie Traction Company, whose car house and twenty-two cars were recently destroyed by fire at Blasdell, is quickly recovering from the disaster. General Manager Calisch has contracted with the General Electric Company for a new power plant which will be built near Athol Springs and is to be ready by August 15. Plans are also being made for a modern new car house. General Manager Calisch has closed a contract with the Cincinnati Car Company for twenty-five modern electric cars.

DETROIT, MICH.—Contracts have been signed by C. H. Crosby, vice-president and general manager of the United States Express Company, and President J. C. Hutchins, of the Detroit United Railway Company, providing that beginning July 1 the trolley lines of the Detroit United will handle business for the United States Express Company. It is expected that the service will be extended to Kalamazoo and Lansing by a similar contract with the Michigan United Railway and that this will prove an additional incentive to complete the electric chain between Jackson and Chicago.

BALTIMORE, MD.—At the annual meeting of the stockholders of the Maryland Electric Railways Company the following directors were chosen: John Wilson Brown, Shellman B. Brown, Edwin G. Baetger, Joseph C. France, Frank S. Hambleton, Winfield J. Henry, all of Baltimore, and Daniel R. Randall, of Annapolis. The only change was the substitution of Mr. Henry for Mr. Harmon B. Bell, who declined a reelection. The board reelected John Wilson Brown, president; Shellman B. Brown, vice-president, and George May, secretary.

OWEGO, N. Y.—The directors of the recently incorporated Ithaca-Owego Traction Company have elected officers and are prepared to push the trolley proposition in an active manner. At the election of officers the following were chosen: president, Sherman Collins; vice-president, Charles D. Nixon; secretary and treasurer, George R. Peck. Mr. Collins has refused to accept his election on account of the pressure of other business. No action has yet been taken, however, and another meeting in the near future will probably be necessary to fill the office.

ROCHESTER, N. Y.—At the annual meeting of stockholders of the Rochester Electric Railway Company all the old directors were reelected. They are: Horace E. Andrews, of Cleveland; William K. Vanderbilt, Jr., E. V. W. Rossiter, John Carstensen, W. J. Wilgus, W. C. Brown, of New York; Albert H. Harris, Charles T. Chapin, George W. Archer, George F. Roth, W. C. Barry and Granger A. Hollister, of Rochester; Walter Kernan, of Utica, and John J. Stanley, of Cleveland. The Rochester Electric owns the Charlotte trolley road from the Ridge Road to Ontario Beach.

BURLINGTON, IOWA—The Burlington-Bonaparte Interurban has elected the following directors and officers: president, J. A. Johnson, of Bonaparte; first vice-president, John Blaul, of Burlington; second vice-president, T. J. Lampe, of West Point; treasurer, H. H. Meek, of Bonaparte; secretary, Ed. E. Egan, of Burlington; directors, Dan Cresap, of Bonaparte; A. C. Roberts, of Bonaparte; C. C. Paule, Luke Palmer and W. E. Blake, of Burlington. The articles provide for $10,000 capital stock, and work of laying out the route, obtaining the right of way, etc., is to commence without delay.

PORTLAND, ME.—The Portland & Northern Railroad, a corporation organized under the Maine law for the purpose of building and operating an electric railroad between Portland and Brighton, has organized under its charter. William M. Sturgis and N. D. Sturgis, of Scranton, Pa.; Tracy W. Holland, of New York city; Enoch Foster, Llewellyn Barton, Howard Winslow, H. L. Forhan, of Portland, and S. O. Hancock, of Casco, are among the incorporators. Officers were elected and plans for the future discussed. It is planned to build a standard gauge road outside of the highway so far as practicable. The business will be largely freight.

INDIANAPOLIS, IND.—At the annual stockholders' meeting of the Indianapolis Traction and Terminal Company the old board of directors was reelected, as follows: Hugh J. McGowan, H. P. Wasson, John J. Appel, of this city; Arthur W. Brady, of Anderson, and W. Kesley Schoepf, of Cincinnati. The directors reelected the following officers: president, Hugh J. McGowan; secretary-treasurer, W. F. Milholland; vice-presidents, H. P. Wasson, John J. Appel, Robert I. Todd, E. B. Peck, of this city, and E. G. Edwards, of Cincinnati. Mr. Todd also is general manager. The report of the treasurer showed that the company was in good financial condition.

HUMBOLDT, TENN.—A number of leading men have reorganized the old Missouri, Tennessee & Georgia Railroad Company, and elected the following officers: Colonel I. H. Dungan, president; C. H. Ferrell, first vice-president; Dr. J. H. Thomas, second vice-president; G. D. Ferrell, secretary; O. C. Sharp, treasurer. Directors: I. H. Dungan, C. H. Ferrell, Dr. J. H. Thomas, G. D. Ferrell, O. C. Sharp, W. W. Baird and J. P. Turner. The proposition now is to build a belt electric line traversing Crockett county and touching the towns of Gadsden, Alamo, Johnson's Grove, Maury City, Crockett Mills, Eaton, Brazil and Gibson Wells, having its beginning and terminal in Humboldt.

TROY, N. Y.—The directors of the United Traction Company have authorized the issuance of $859,000 bonds under the mortgage for $6,500,000 made by the company in 1904. The new bonds are a part of the issue of first consolidated mortgage 4½s of the traction company, and when this additional amount is put out, all the bonds under the mortgage will have been issued. The new bonds are to pay for extensions to be made to the company's lines in Albany and Troy, the contracts for which will consume the entire issue. The directors of the company also adopted a resolution to take up the option for an additional ten-year contract for power supplied by the Hudson River Power Transmission Company to the trolley lines in Albany and Troy.

SPRINGFIELD, MASS.—Plans are being brought to a successful issue by which the facilities of the trolley express system radiating from Springfield, for handling freight, will be more than doubled. The scheme will embrace Chicopee, Westfield, Palmer, Indian Orchard, Monson and way points, which will be connected with a quick delivery system. A large central warehouse will be erected in the business section of the city, and the Trolley Express Company is already negotiating for a site for this building. The company will also have a down-town main office centrally located, where it will take care of its general office work. In Westfield, Palmer and Monson, smaller warehouses with branch offices will

be maintained, for the purpose of affording the suburban points an efficient express service. C. V. Woods, who has recently been appointed to the head of the freight service department operating under the New England Investment and Securities Company, is studying the situation, and as soon as the desired land can be secured for warehouses steps will be taken to get the plan in working order before fall. The expansion of the system in this city and nearby points is part of a general scheme which will affect the trolley express holdings all over the state, under the New England Investment and Securities Company, and the Consolidated's express business in Connecticut. The new system, according to report, will first be introduced into New York, Boston, New Haven and Worcester, and eventually will include Springfield, Hartford, Providence, New London and other big central freight stations on the New Haven system.

PERSONAL MENTION.

MR. J. H. McGILL, president of the Crescent Company, Valparaiso, Ind., visited Chicago last week in the interest of his company.

MR. J. L. BARNARD, manager of the Minneapolis district of the Bryan-Marsh Company, spent some time at headquarters in Chicago last week.

MR. ALFRED C. LOOSE, advertising manager of the National Brake and Electric Company, Chicago, Ill., was a Chicago visitor last week.

M. LE CHATELIER, an eminent electrician and physicist, best known for his work in the design and construction of the pyrometer which bears his name, has been elected a member of the French Academy of Sciences to fill the vacancy caused by the death of Henri Moissan.

MR. E. J. KULAS, general manager of the Brilliant Electric Company, Cleveland, Ohio, manufacturer of Brilliant incandescent lamps, was a visitor last week in New York and the Atlantic Coast cities. This company is now making great progress in the construction of its new factory at Conneaut, Ohio. This factory, it is said, will be one of the largest and most perfectly equipped of all modern incandescent lamp factories.

MR. R. E. FOX, JR., has resigned the management of the New York office of the Platt Iron Works Company, to become secretary and manager of the sales department of the Engineer Company, 111 Broadway, New York city. Mr. Fox is a graduate of Cornell University, and was prominent as manager of the southern territory of the Platt Iron Works Company with headquarters at Atlanta, Ga., which position he held for three years. He is a member of the American Society of Mechanical Engineers. The Engineer Company manufactures and installs the balanced draft system of furnace regulation.

NEW MANUFACTURING COMPANIES.

COLORADO SPRINGS, COL.—A new company has been organized in this city for the promotion of electrical and refrigerating patents under the name of the Federal Electric and Refrigerating Company. The company is capitalized at $50,000, the incorporators being former Mayor H. C. Hall, D. F. Carpenter and E. A. Sunderlin, all of Colorado Springs.

BRIDGEPORT, CT.—Articles of incorporation have been filed with the secretary of state by the Bridgeport Light and Equipment Company, which will install patented appliances for gas or electricity. The capital stock is $50,000, divided into 500 shares of $100 each. The company will commence business with $45,000 and the incorporators are J. Harry Crossley, H. A. Sherwood and James A. Turner. Mr. Crossley has been elected president. J. A. Morris is secretary and treasurer.

NEW INCORPORATIONS.

INDIANAPOLIS, IND.—Citizens' Mutual Telephone Company. $10,000.

ATLANTA, GA.—Paulding County Electric Company. To build a thirty-foot dam at the Owen's Mill site near Dallas, Ga. $250,000.

DENVER, COL.—Beaver River Power Company, Telluride. $500,000. Incorporators: Cooper Anderson, S. A. Bailey and I. E. Brown.

BUFFALO, N. Y.—The Sackett Electric Construction Company. $5,000. Directors: Herbert I. Sackett, John Hora, Jr., and Walter F. Hofheins.

DENVER, COL.—Ordway Electric Light and Power Company. $20,000. Incorporators: Robert F. Burnschein, W. S. Burnschein and W. O. Burnschein, Ordway.

BAGLEY, IOWA—Bagley Mutual Telephone Company, Bagley, Guthrie county. $9,990. President, Benjamin Corsant; vice-president, John Spears; secretary, A. F. Holmes; treasurer, W. E. Quayle.

GUTHRIE, OKLA.—Citizens' Street Railway Company of Oklahoma City. $100,000. Directors: J. J. Culbertson and J. S. Leclerq, of Paris, Tex.; W. F. Harn, J. F. Winans and R. Q. Blakeney, of Oklahoma City.

DOVER, DEL.—Aerial Transit and Telephone Company. To act as a carrier, forwarding agent, to construct and operate telephone exchanges and telephone pole and air lines. $1,000,000. Incorporators: Henry McCabe, of Arcola, Ill.; T. L. Galbreath, Charleston, Ill., and Frank Osborne, of Pinesboro, Ill.

JERSEY CITY, N. J.—The International Fuel and Power Company. To dry and compress peat into briquettes, coal and other carbon substances, and to operate railroads and electric light plants. $20,000,000. Incorporators: Peter T. Austin, 89 Pine street, New York city; Benjamin W. Tucker, Newark, and Walter T. Griffin, Plainfield.

SPRINGFIELD, ILL.—Centralia & Sandoval Railway Company. To construct an electric railway from Centralia to Sandoval, paralleling the line of the Illinois Central Railroad. $2,500. Incorporators and first board of directors: W. M. Warnock and George D. Burroughs, both of Edwardsville; Edward R. List and Frank Noleman, both of Centralia, and Fred E. Allen, of St. Louis, Mo.

DENVER, COL.—Denver & Greeley Railway Company. To build an electric road connecting the two cities named and extending through an extensive farming district in northern Colorado. $50,000. Incorporators: Mayor Frank J. Green, John C. Mosher, E. J. Decker, George M. Huston, H. H. Hake, of Greeley; J. D. Houseman, J. F. Church, John S. Flower, Max Strauss, James Williams and H. G. Clark. John C. Mosher is president.

TELEPHONE AND TELEGRAPH.

CLEVELAND, OHIO—At the annual meeting of the Cuyahoga Telephone Company the stockholders authorized the issue of $500,000 treasury bonds.

LINWOOD, NEB.—The new directors elected for the Linwood Telephone Company are M. J. Rezac, Charles Homalka and John Kucera. The company has thirty-six miles of line in operation.

CHICAGO, ILL.—The Chicago Telephone Company will erect an operating department building, eight stories high, 40x160, at 87-89 Franklin street, to cost $300,000. Pound & Pound are the architects.

PASADENA, CAL.—Facilities for accommodating 2,000 additional patrons have been installed by the Pacific Telephone Company. Two new sections of switchboard have been placed in position, and a portion of them is already in use, as the old facilities were becoming inadequate.

CLEVELAND, OHIO—The new east exchange of the Cleveland Bell Telephone Company on Prospect avenue has been opened and the service of 5,000 subscribers switched from the old exchange on Carnegie avenue. The new board is one of the largest in the Middle West, providing for 15,000 subscribers.

SAN FRANCISCO, CAL.—The Direct Line Telephone Company has filed amended articles of incorporation, which provide for a reduction of its capitalization from $2,500,000 to $1,000,000, and names a new board of directors, as follows: Joseph A. Stulz, C. F. Runyon, Julius Fay, Robert Capelle, George W. Emmons, William B. Pringle and E. K. Adriano, the latter being the only member of the old board retained.

INDUSTRIAL ITEMS.

THE GENERAL ELECTRIC COMPANY, Schenectady, N. Y., has published a handsome catalogue describing and illustrating its fans for 1907.

ALFRED E. MOORE, Philadelphia, Pa., announces that H. E. Cobb will not represent him in Chicago, Ill., after June 30. Definite announcement concerning the western territory will be forthcoming later.

THE AUTOMATIC ELECTRIC COMPANY, Chicago, Ill., has hit upon a unique scheme of advertising, in the shape of a reproduction of telegrams endorsing the use of the automatic system for the city of New York.

THE H. T. PAISTE COMPANY, Philadelphia, Pa,, in bulletin No. 44, describes "Pushin" attachment plugs, two-piece rosettes, "P-K" rosettes, fusible hanger boards for multiple arc lamps, and Paiste taplets.

H. M. BYLLESBY & COMPANY, Chicago, Ill., has been retained as consulting and supervising engineer by the Mobile & Ohio Railroad Company, for the rehabilitation and electrification of its general repair shops at Whistler, Ala.

THE BRISTOL COMPANY, Waterbury, Ct., has ready for distribution bulletin No. 57, describing its type 8 switchboard form alternating-current-direct-current recording voltmeter. The bulletin also describes the type 8 portable form recording voltmeter.

THE ILLINOIS ELECTRIC COMPANY, 239 Madison street, Chicago, Ill, has issued a net price list and discount sheet applying to catalogue No. 16, descriptive of high-grade electric light supplies, construction material and specialties. The company now carries a complete line of tungsten lamps.

THE M. W. DUNTON COMPANY, Providence, R. I., has been incorporated with a capital of $50,000 to take over the business of M. W. Dunton & Company. The new company will devote its attention exclusively to insulating material. The management remains the same.

THE ROBBINS & MYERS COMPANY, Springfield, Ohio, has published an information book on "The Standard" motors for direct-current circuits. This book is replete with interesting information concerning this type of apparatus, and will be sent upon request to any one interested in direct-current machinery.

ARTHUR O. EINSTEIN, Chicago, Ill., has opened an office as manufacturers' agent at 103 West Adams street, where he will carry in stock at present the goods of the Trio Manufacturing Company, Rock Island, Ill., maker of knife switches and enclosed fuses. Mr. Einstein has had twelve years' experience as a traveling salesman through the central states, his last position being that of sales manager for the Manhattan Electrical Supply Company, Chicago branch. He will add to the lines he already represents.

THE ELMER P. MORRIS COMPANY, New York, is now well established in its new offices and warerooms at 72 Trinity Place, where it has materially increased its accommodations, carrying a larger stock in hand and secured enlarged office facilities. The company is a large dealer in electric railway line materials, especially catenary material for suburban and high-speed lines, brackets and supplies, plain and ornamental line, poles and copper and insulated wires and cables. Special facilities are available for handling orders for foreign markets, and this character of orders forms a substantial proportion of its business. Elmer P. Morris, president of the company, is one of the pioneers of the electrical industry, having been associated with the General Electric Company interests in the early days of electric railroads.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia, Pa., has issued a booklet entitled "Facts About Storage Batteries" for the guidance of dealers, supply houses and contractors. This booklet gives in concise form information which will be of assistance to the dealer in electrical supplies in determining what his customer will require in the way of storage batteries for use in connection with interior telephone systems, electric bells, low-voltage lamps, gas or gasolene engine ignition, etc. The booklet is illustrated with plates showing the different parts entering into the construction of the storage battery, and gives examples of figuring upon material required for different services, arrangements for charging, etc. This book will be forwarded to those interested in this subject upon request to any of the sales offices of the company.

Record of Electrical Patents.

Week of June 18.

857,021. SIGNALING SYSTEM FOR RAILROADS. Francis M. Black, Kincaid, Kan. The signals are given by varying the strength of the signaling current.

857,024. PENDANT ELECTRIC FIXTURE. Walter L. Bradshaw, Cambridgeport, Mass., assignor, by mesne assignments, to John E. R. Hayes, Melrose, Mass. A cone attachment for gripping the cord.

857,041. CAN OR RECEPTACLE FOR STORAGE BATTERIES. Thomas A. Edison, Llewellyn Park, Orange, N. J., assignor to Edison Storage Battery Company, West Orange, N. J. A seamless receptacle made of electro-deposited iron and carbon.

857,045. LIGHTNING ARRESTER. George L. Foote, New York, N. Y., assignor to Foote, Pierson & Company, New York, N. Y. The two electrodes are separated by a cylinder of insulating material grooved externally.

857,058. AUTOMATIC INTERLOCKING CONTACT MECHANISM FOR ELECTRIC RAILWAY SYSTEMS. Frank Hedley, James S. Doyle and Hjalmar Wallerstedt, New York, N. Y. Two or more interlocking shoes are provided for different positions of the third rail.

857,059. AUTOMATIC CONTACT MECHANISM FOR ELECTRIC RAILWAY SYSTEMS. Frank Hedley, James S. Doyle and Hjalmar Wallerstedt, New York. Two or more pivotally mounted contact shoes carried on the car.

857,062. ELECTRICAL TRANSFORMER. John D. Hilliard, Albany, N. Y. A regulating switch is placed in the oil within the case.

857,079. MULTIPLEX TELEPHONY. Maurice Leblanc, Paris, France, assignor to Westinghouse Electric and Manufacturing Company. Single-phase alternating currents of different frequencies are used.

857,080. APPARATUS FOR TRANSFORMING CONTINUOUS CURRENTS. Maurice Leblanc, Paris, France, assignor to Westinghouse Electric and Manufacturing Company. A system for transforming unidirectional currents of one tension into unidirectional currents of another tension.

857,087. ELECTRIC SNAP-SWITCH. Walter S. Mayer, Philadelphia, Pa., assignor to the Machen & Mayer Electrical Manufacturing Company, Philadelphia, Pa. A pivoted lever switch.

857,101. CROSS-ARM FOR TOWERS. La Verne W. Noyes, Chicago, Ill. A cross-arm for steel towers.

857,122. ELECTRIC HEATER. Elihu Thomson, Swampscott, Mass., assignor to General Electric Company. A transformer having its primary circuit embedded in a mass of hysteretic iron.

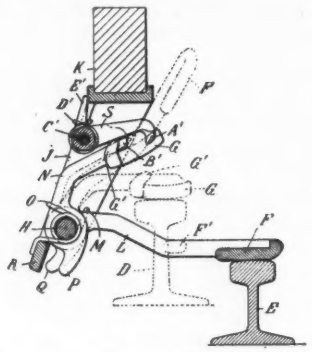
857,124. PHOTOMETER. Theodore Torda, London, England. A selenium cell used with a timing shutter.

857,132. DYNAMOELECTRIC MACHINE. Joseph R. Weszelinovitz, Chicago, Ill. The armature winding is provided with two kinds of connections, one fixed and one variable.

857,137. BINDING-POST. William G. Winter, St. Louis, Mo., assignor to the Emerson Electric Manufacturing Company, St. Louis, Mo. A screw binding-post.

857,138. REGULATING RESISTANCE FOR ELECTRIC CURRENTS. Paul Wöbber, Cuxhaven, Germany. A liquid rheostat.

857,142. STARTING RHEOSTAT. William C. Yates, Schenectady, N. Y., assignor to General Electric Company. The motor may be controlled by a portion of the starting resistance, with the controlling arm in the off position.



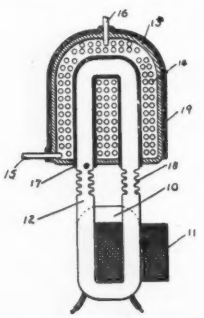
857,059.—Automatic Contact Mechanism for Electric Railroad Systems.

857,165. MOTOR CONTROL. Friedrich Eichberg, Berlin, Germany, assignor to General Electric Company. An alternating-current commutator motor controlled by passing direct current through one winding.

857,184. DYNAMOELECTRIC MACHINE OR ELECTRIC MOTOR. Robert Lundell, New York, N. Y. The field winding is distributed for producing a proper commutating field.

857,186. ELECTRIC SWITCH. Walter S. Mayer, Philadelphia, Pa., assignor to the Machen & Mayer Electrical Manufacturing Company, Philadelphia, Pa. A push-switch.

857,191. AUTOMATIC MOTOR-CONTROLLING APPARATUS. Frederick W. Newell, Hastings-on-Hudson, N. Y., assignor to Otis Elevator Company, Jersey City, N. J. A differentially wound magnet for preventing excessive speed.



857,122.—Electric Heater.

857,215. APPARATUS FOR AUTOMATIC LIGHTING OF GAS-JETS AND THEIR EXTINCTION AFTER A PREDETERMINED TIME. Frederick Testor, Stockholm, Sweden. A magneto with oscillating armature.

857,262. GROUND AND FAULT DETECTOR FOR ELECTRIC DISTRIBUTION SYSTEMS. Philip Torchio and Thomas W. Varley, New York, N. Y. A detector actuated by a change in capacity of a system of feeders.

857,267. REDRESSING AND REGULATING DEVICE ENABLING TO TRANSFORM A SINGLE-PHASE CURRENT INTO A CONTINUOUS ONE. Louis R. Auvert and Alphonse F. E. Ferrand, Paris, France. A rotary transformer consisting of a ring of magnetizable material wound with two series of coils.

857,277. ELECTROLYTIC PROCESS OF PURIFYING LIQUIDS. John T. Harris, New York, N. Y. The liquid is electrolyzed, using a magnetized anode.

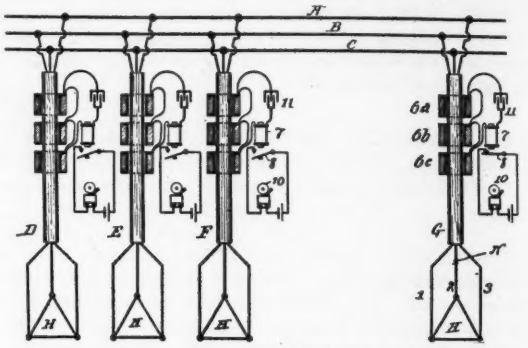
857,311. REGULATING ATTACHMENT FOR ELECTRIC LIGHTS. Chetwood Smith, Worcester, Mass. A magnetically controlled cutout.

857,375. RECEIVING APPARATUS FOR WIRELESS TELEGRAPHY. Ludwig Arnson, New York, N. Y. A receiver formed of a hysteresis motor.

857,381. HEATING BAR FOR ELECTRIC FURNACES. Archibald L. Brougham, New York, N. Y. The heating portion of the bar is anastomosed to the terminals.

857,384. ELECTRIC LIGHT SWITCH. Harry R. Coffey, Chicago, Ill. A full attachment for switch sockets.

857,394. GENERATOR FOR ALTERNATING ELECTRIC CURRENTS. William Hallock, New York, N. Y. The generator field has concentric sets of polar projections staggered radially.



857,262.—Ground and Fault Detector for Electric Distribution Systems.

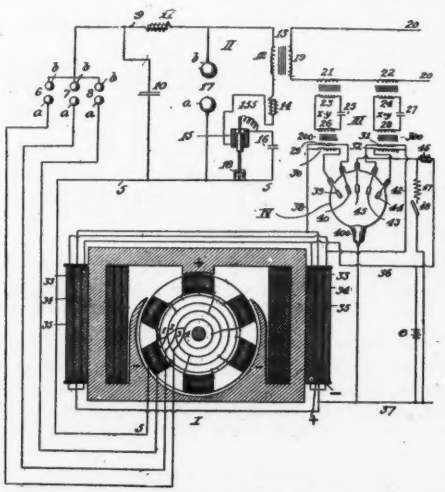
857,404. ELECTRIC LAMP REGULATOR. Emery Johnson, Newberg, Ore. A regulating socket.

857,446. BLOCK SIGNAL SYSTEM FOR RAILWAYS. Homer G. Comstock, San Francisco, Cal. The signals are operated by buttons depressed by the train.

857,480. TELEPHONE SYSTEM. Lewis B. Niemann, Staplehurst, Neb. A manual exchange.

857,485. ELECTRIC HEATER. James A. Reardon, Seattle, Wash. The heating wires are wound in parallel grooves on an insulating support.

857,530. WIRELESS TELEPHONE. Francis J. McCarty, San Francisco, Cal.; Henry A. McCarty, administrator of said Francis J. McCarty, deceased, assignor to McCarty Wireless Telephone Company, San Francisco, Cal. The current from a telephone transmitter is passed through a third winding on the induction coil.



857,560.—Process for Generating High-Frequency Alternating Currents.

857,560. PROCESS FOR GENERATING HIGH-FREQUENCY ALTERNATING CURRENTS. Maurice Leblanc, Paris, France, assignor to Westinghouse Electric and Manufacturing Company. Unidirectional current is employed for charging a resonator, which is discharged through a path of low resistance.

857,561. APPARATUS FOR GENERATING HIGH-FREQUENCY ALTERNATING CURRENTS. Maurice Leblanc, Paris, France, assignor to Westinghouse Electric and Manufacturing Company. A device for charging a resonator with unidirectional current.

ELECTRICAL REVIEW

VOL. L—No. 10. Registered in United States Patent Office. NEW YORK, SATURDAY, MARCH 9, 1907. THREE DOLLARS A YEAR. SINGLE COPIES TEN CENTS.

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See Page 17

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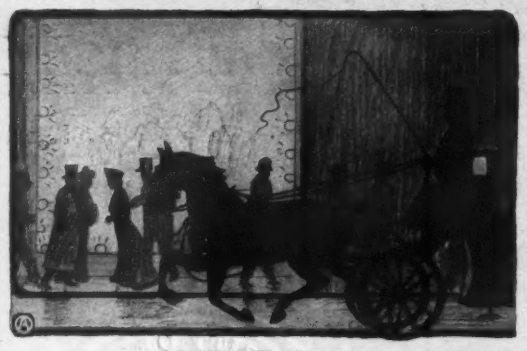
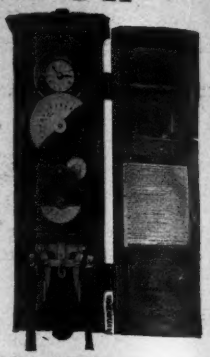


Mr. Storekeeper with the Conspicuous Show Window:

Of course you can't bother turning your lights on and off while the theatre crowd is passing, but why not purchase an ANDERSON ELECTRIC TIME SWITCH and secure the lifelong service of a device that will do this automatically, faithfully, and accurately at no further cost than the moderate amount of fir st purchase? It's worth looking up. Shall we send you a circular?

This is our Trade-Mark and not only identifies our product, but is a guarantee of quality wherever found.

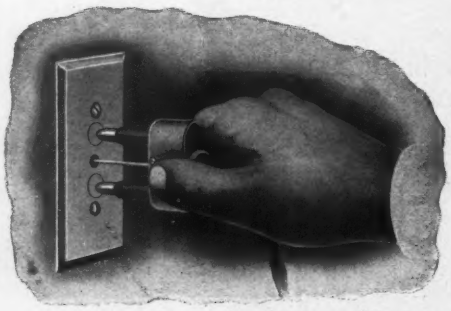


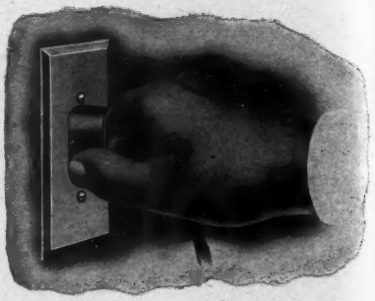
ALBERT & J. M. ANDERSON MFG. CO., BOSTON, NEW YORK, CHICAGO

If You Have Not Used

"DIAMOND H" FLUSH RECEPTACLES

It will Pay You to Try Them in Your Next Installation and Find Out Why So Many Contractors Are Using Them in Preference to All Others.





NO LIDS TO PRY OPEN.
NO BROKEN FINGER NAILS.
CANNOT GROUND OR SHORT CIRCUIT.
OPENS OR CLOSES AUTOMATICALLY BY INSERTING OR WITHDRAWING PLUG.

DON'T FORGET TO CALL THEM "DIAMOND H."

HART MFG. CO., Hartford, Conn.

NEW YORK BOSTON CHICAGO DENVER SAN FRANCISCO
TORONTO, ONT. LONDON, ENG.

The Result of 15 Years of Non-Arcing Enclosed Fuse Experience is concentrated in

Every essential feature is a step nearer Enclosed Fuse Perfection

THE SACHS COMPANY
HARTFORD, CONN.

BRANCH OFFICES: 203 Broadway, New York, N. Y. 269-271 So. Canal St., Chicago, Ill. 130 Bay St., Toronto, Can.
170 Summer St., Boston, Mass. 1725 California St., Denver, Col. 25 Victoria St., London, S. W., Eng.

THE "Chloride Accumulator"

For Car Lighting and Railway Signal Service

IS BUILT TO MEET THE POINT OF VIEW OF THE RAILROAD MAN.

43,300 cells are operating in Car Lighting Service
61,337 cells are operating Signal and Interlocking Switches

BULLETINS 99 AND 100 DESCRIBE THESE APPLICATIONS

THE ELECTRIC STORAGE BATTERY CO.

PHILADELPHIA

—Sales Offices—

Philadelphia	New York	Boston	Chicago	St. Louis	Cleveland	Pittsburg	Atlanta	Oakland, Cal.
Allegheny Ave. & 19th St.	100 Broadway	60 State St.	Marquette Bldg.	Walnwright Bldg.	Citizens' Bldg.	Frick Bldg. Annex	Candler Bldg.	525 13th Street

Canada: Canadian General Electric Co., Ltd., Toronto Cuba: G. F. Greenwood, Mgr., 34 Empedrado Street, Havana 1

WESCO

FAN MOTORS

Our 1907 Fan Catalog, showing a most complete line of DESK and CEILING FANS, both for DIRECT and ALTERNATING CURRENT, is now ready for distribution. Sent free for the asking. Write for it. . . . . .

The Wesco Supply Co.

"EVERYTHING ELECTRICAL"

ST. LOUIS, MO.
FORT WORTH, TEXAS

WESCO

KEYSTONE SWITCHBOARD POTENTIAL AND CURRENT INDICATOR

The instrument illustrated here is designed for use on alternating current circuits only within the ranges covered by our price list. This instrument is small and neat in appearance, case being furnished in full black japan. It will be found very useful in small isolated plants, being economical both in price and size.

All systems are electro-magnetic, the voltmeters having front connections and the ammeters back connections.

This instrument is absolutely accurate in calibration, containing the same system as is employed in our other electro-magnetic instruments. They are not, however, dead-beat. These instruments are shielded from the effects of external magnetism, and cases are dust proof.

These instruments can not be furnished in other than standard finish.

Catalogues 12 and 13 describe our complete line of Portable and Switchboard A. C. and D. C. Instruments

KEYSTONE ELECTRICAL INSTRUMENT COMPANY

NINTH STREET AND MONTGOMERY AVENUE, PHILADELPHIA, PA.

New York, 114 Liberty Street Boston, 170 Summer Street Chicago, 269 S. Canal Street

(8)

LEADS THEM ALL

"ELECTRA"

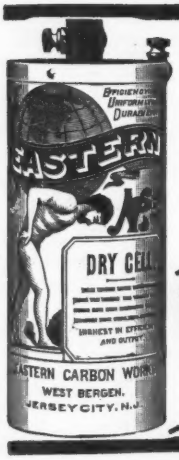
CARBONS

HIGHEST GRADE NUERNBERG CARBONS

THEIR USE MEANS MORE LIGHT, BRIGHTER LIGHT AND CLEAN GLOBES.
"ELECTRA" CARBONS ARE MADE OF THE VERY BEST MATERIAL.
THEY ARE ABSOLUTELY UNIFORM IN QUALITY, DIAMETER AND STRAIGHTNESS

LOOK FOR THE TRADE-MARK

HUGO REISINGER
SOLE IMPORTER
11 BROADWAY NEW YORK



More Voltage, Amperage, Life and Efficiency than all others.

EASTERN HIGH GRADE IGNITION CELLS

EASTERN BATTERY CONNECTOR

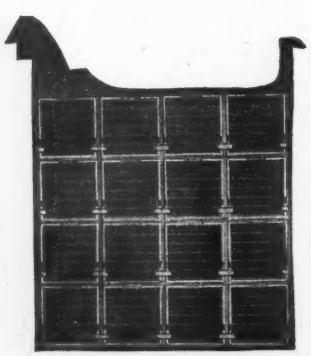
Positively Won't Shake Loose. For Sale By All Dealers.

EASTERN CARBON WORKS
Carbon Place, JERSEY CITY, N. J.

Shaw Non-Arcing Lightning Arresters

PROTECTORS THAT PROTECT
THE IDEAL VOLTAGE SAFETY VALVE

LORD ELECTRIC COMPANY
NEW YORK, N. Y., U. S. A.
Agents in all principal cities

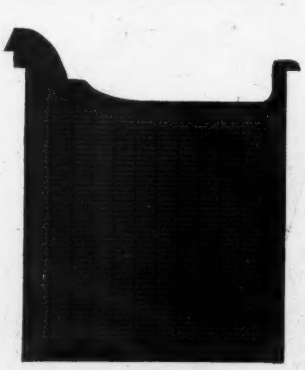


POSITIVE PLATE

"Unit Accumulator"

Has a Planté positive plate and a Faure negative plate, insuring economical and reliable operation in a storage battery installation for any purpose.

National Battery Company
ELECTRIC STORAGE BATTERIES
BUFFALO N.Y.
CHICAGO OFFICE 450 OLD COLONY BLDG.
NEW YORK OFFICE 1606 BROADWAY



NEGATIVE PLATE

DO YOU UNDERESTIMATE MOISTURE RESISTANCE?

Keystone Insulation will interest you

¶ Heat resistance is obtained in insulation only by sacrificing moisture resistance.

¶ High heat resistance is not necessary. The rays of a summer sun should not affect insulation. Heat resistance above that point is unnecessary.

¶ Moisture resistance is all important. The constituents of an insulation must be proportioned so as to resist all attacks of rain, hail, snow, sleet and ice.

¶ "Keystone" Insulation has been severely tested for its moisture resisting qualities, and we feel satisfied with the results.

¶ "Keystone" leads in mechanical strength. The metal parts in "Keystone" will break down before the insulation.

¶ We want you to write us for a copy of our booklet No. 55.

ELECTRIC SERVICE SUPPLIES CO.

"Supplies for Every Electric Service"

MAYER & ENGLUND DEPT. PHILADELPHIA | GARTON-DANIELS DEPT. KEOKUK | PORTER & BERG DEPT. CHICAGO

"Noark" Fuse Talks—No. 1

64 TIMES BETTER THAN REQUIREMENTS 64

In recent tests on "Noark" National Standard Fuses, 600-volt, they operated perfectly on a dead short circuit of 19,250 K.W., or 64 times the underwriters' requirements (300 K.W.). In a similar test on 250-volt Fuses, they handled 2,700 K. W., or 9 times the requirements (300 K.W.). *This means much to every user of Enclosed Fuses*

H. W. JOHNS-MANVILLE CO.

MANUFACTURERS OF ASBESTOS AND MAGNESIA PRODUCTS, ASBESTOS ROOFINGS, PACKINGS, ELECTRICAL SUPPLIES, ETC.

New York, Milwaukee, Chicago, Boston, Philadelphia, St. Louis, Pittsburg, Cleveland, Buffalo, San Francisco, Los Angeles, Seattle, Kansas City, Minneapolis, New Orleans, Buffalo, Dallas, London

FOR GREAT BRITAIN AND CONTINENT OF EUROPE
TURNERS & MANVILLE, LTD., 81 FENCHURCH STREET, LONDON, E. C. 508

REGISTERED NOARK U.S. PAT. OFFICE

The Leeds & Northrup Co.

4901 Stenton Avenue, Philadelphia
Monadnock Block, Chicago

The L. & N. Portable Testing Sets are accurate instruments for the convenient measurement of resistance and location of faults.
We make a complete line of Cable Testing Apparatus, Standardizing Apparatus for Calibrating Ammeters and Voltmeters, Galvanometers, Resistance Boxes and Standards, Condensers and other electrical measuring apparatus. Our complete illustrated catalogues sent on request.

Electrical Measuring Instruments

PLATINUM

SCRAP PURCHASED

Contacts of All Forms. Wire for Wireless Telegraphy.
Resistance Wire. Wire and Sheet for All Purposes.

AMERICAN PLATINUM WORKS
NEWARK, N. J.

THE TALKING SIGN

FLASHERS, TIME SWITCHES,
GOOD ELECTRIC SIGNS.
THE ELECTRIC MOTOR AND EQUIPMENT CO.
NEWARK, N. J.

VOLT AND AMMETERS

DIRECT OR ALTERNATING

High-Grade Instruments at Reasonable Prices

Send for Catalogue and Discounts

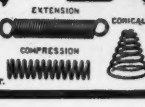
DONGAN INSTRUMENT COMPANY
ALBANY, N. Y.

GENERAL STORAGE BATTERY CO. BIJUR HIGH DUTY NEW YORK

Write for Catalogue A
TO
GENERAL
STORAGE BATTERY CO
42 Broadway, N. Y.

CARY SPRING WORKS

Manufacturers of
Wire and Springs
For Machinery, Motors, Clocks, Music Boxes and all kinds of Electrical Purposes
Write for booklet, and please mention this paper.



240-242 West 29TH ST. NEW YORK

VOLTMETERS AND AMMETERS

SWITCHBOARD TYPE. Round Pattern, 5" diameter 1½" thick. Specially designed for small installations.
PORTABLE TYPE. Rectangular Pattern. Compact enough to fit the pocket. Accurate enough for a standard.

Write for Catalog.

L. M. PIGNOLET
76 CORTLANDT STREET, NEW YORK

Emerson Fans for Alternating Current

1907 CATALOGUES sent on request
Prices quoted to the trade only
The Emerson Electric Mfg. Co., St. Louis, Mo.
136 Liberty Street, New York City

HOW ARE YOUR BATTERIES?

The "Connecticut" pocket meters will tell you.

TWO METERS IN ONE

0-6 volts—0-30 amperes - - $6.00
Ammeter only—0-30 amperes - $4.00

The ampere side is used for testing dry and wet batteries, the voltage side for storage batteries.

ACCURATE, DURABLE, LOW IN PRICE

CONNECTICUT TELEPHONE & ELECTRIC CO.
MERIDEN, CONN., U. S. A.
Send for circular No. 40

CHICAGO EDISON COMPANY REPAIR SHOPS

76 MARKET STREET, CHICAGO. TELEPHONE MAIN 1280

FIRST-CLASS EQUIPMENT THROUGHOUT

DYNAMOS, ARMATURES, MOTORS, ARC LAMPS, INSTRUMENTS
High Grade Machine Work of all kinds. Correspondence Solicited

Wire Machinery

Insulating, Cabling and Stranding Machines

Rubber Mill Machinery
Hydraulic Machines

Aiton Machine Company

ARTHUR S. BEVES, President THOS. A. AITON, Vice-President
JOHN S. SHOWELL, Secretary
126 Liberty St., New York Works: Harrison, N. J.

"Southern Mills"

A Southern Monthly Industrial and Electrical Journal

Published at GREENSBORO, NORTH CAROLINA

The only journal of its kind published in the South, and as an advertising medium for those wishing to reach all the industries, this journal is unexcelled

SUBSCRIPTION PRICE, $1.50 PER YEAR

KEEP YOUR EYE ON THIS BILL BOARD

CROOKED Carbons cause TROUBLE. When ordering specify the STRAIGHT kind

COLUMBIA

COLUMBIA Carbons are ALL PERFECTLY STRAIGHT and of the SAME DIAMETER

NATIONAL CARBON COMPANY, CLEVELAND, OHIO, U. S. A.

Same as a Ball Joint
The Universal Adjustment of
Fullman Floor Outlets

makes the floor plate line up perfectly with the floor surface, no matter how much out of level the box body is.

The catalogue tells all about it. May we send it?

Manufactured by
STEEL CITY ELECTRIC CO.
PITTSBURGH, PA.

NEW YORK: Gilpin, V. C., Sales Agent, 120 Liberty St

BOSTON T. C. Sias 44 Federal St.
CHICAGO I. A. Bennett 137 S. Clinton St.
CLEVELAND W. P. Ambos Citizens' Bldg.
ATLANTA Newcomer-Maury Co. 108 S. Forsyth St.
BUFFALO G. E. Bennett 227 Vermont St.
SAN FRANCISCO, CAL. Brown-Spear-Sloane Co. Union Trust Bldg.

Showing Parts Ready for Assembling

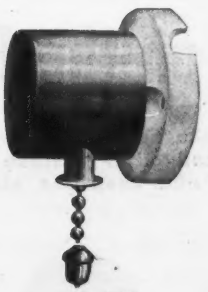
New Business
FOR THE
Central Station

is most readily influenced by a judicious use of the Central Station product—Electricity.

Our line of Electrical Advertising Novelty Signs is especially adapted to Central Station publicity. Many of the Lighting Companies are now using them to good effect.

WRITE FOR CIRCULAR AND PRICES

SOLAR ELECTRIC COMPANY
161-163 South Canal Street, :: :: CHICAGO



No. 5027

WATCH THE CIRCLE

CATALOG ON REQUEST

HUBBELL SWITCH
No. 5027

has a chain to it just like the Socket; that is what makes it so handy.

It's small, only 5 Amperes—but it is strong and of perfect workmanship, as the same mechanical features employed in our Socket are embodied in this Switch. It simply won't wear out.

It can be placed at any height, which is often an advantage—yet always within reach—as the chain may be of any desired length. Neat and ornamental in appearance.

HARVEY HUBBELL
Incorporated
New York Chicago
Main Office and Factory
BRIDGEPORT, CONN.
San Francisco Montreal
R. E. T. Pringle Co.

WIRT RHEOSTATS
THE RECOGNIZED STANDARD
THE WIRT ELECTRIC CO., INC.
PHILADELPHIA
NEW YORK CHICAGO

THIS ILLUSTRATION SHOWS
A BANK OF TEN
CHARGING RHEOSTATS

VERY COMPACT
TAKES UP MINIMUM SPACE

START THE NEW YEAR
WITH THE BEST RHEOSTATS ON THE MARKET

Edgewise type. Switch heads have 15 steps. Ample capacity. Resistance heavy and solidly constructed. Entire rheostat built to stand abuse. For 125-volt circuits up to 100 amperes. SEND FOR PARTICULARS.

EDISON
PRIMARY BATTERIES

WHEN you buy a battery you want current. You want enough for your purpose at all times. You do not want a battery that starts out strong and grows weaker with use or one that consumes itself when not in use. You want, in short, just what the Edison Primary Battery affords—all the current you want, all of the time you want it.

The current of an Edison is as strong and as steady the last day as the first. It is available until the battery is exhausted, at which time it can be renewed at small expense.

If you have actual need for electrical energy, do not make the mistake of buying a battery because it is cheap. Edison cells cost more to buy, but are far cheaper in the end. In battery buying, first cost is a delusion and leads only to disappointments—and expense.

We have a book on batteries that every prospective battery buyer should read. We send it free on request.

Edison Manufacturing Co.

3 Lakeside Avenue, Orange, N. J.

31 Union Square, New York 304 Wabash Avenue, Chicago
25 Clerkenwell Road, London, E. C.

Blake Insulated Staples
HAVE THESE ADVANTAGES:

Can be driven over two or more wires without danger of causing a ground or cross.

Has good driving qualities and will not split the wood.

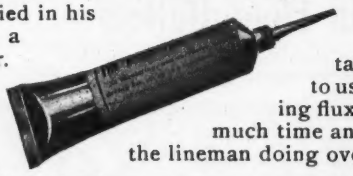
The fibre insulation on Blake Staples can not come off in the driving.

They will not corrode nor eat through the insulation.

Blake Insulated Staples make a Neat and Effective Job

BLAKE TUBE FLUX
BEST FOR THE OUTSIDE WIREMAN

Can be carried in his pocket like a screw-driver.



It does not take two hands to use this soldering flux, thus saving much time and trouble for the lineman doing overhead work.

NO WASTE, FREE FROM DUST AND DIRT. ALWAYS READY FOR USE.

Give a Sample to your Wireman and let him try it.

BLAKE SIGNAL & MFG. CO.

246 SUMMER STREET, BOSTON, MASS. (4)

SEE THE

Teats on the Petticoat

They take all the moisture from the inner and outer surface of the insulator and keep the pin dry.

Hemingray Glass Company

ESTABLISHED 1848
INCORPORATED 1870 } COVINGTON, KY.

Factories, - MUNCIE, INDIANA

The Prometheus Electric Company

Two Electric Devices

FOR DAILY USE

Types No. 10 and 15

"Prometheus" Food and Water Heater

This apparatus will be found useful for a great variety of purposes and may be said to be quite indispensable wherever the electric current is available. It is unsurpassed for quickly heating water, milk, or any kind of liquid food, in kitchen, nursery or sick rooms, in Physicians or Dentists' offices, in hotels, or aboard ship when traveling. A characteristic "PROMETHEUS" Apparatus. Absolutely self-contained, very light, but strong and durable, pleasing in design and highly finished.

Made of heavy copper, shell spun in one piece, quadruple nickel-plated, silvered inside. It can be attached to any lamp socket.

"Prometheus" French Coffee Percolator

These very handsome and ornamental, as well as efficient, Electric Coffee Percolators are specially adapted for use in dining room, on table or sideboard. The heating elements in "PROMETHEUS" Coffee Percolators are placed directly on the under side of flat bottomed body of machine, insuring quick and economical operation. The steam generating in the body of the machine forces the water and steam up through the tube, where it is sprayed over the coffee, and excellent coffee can thus be made in a few minutes.

Made of seamless copper, highly polished, or quadruple nickel-plated, silvered inside. Can be connected to any lamp socket.

Type No. 26

WRITE FOR 1907 CATALOG

The Prometheus Electric Co.

240 East 43d Street - - - NEW YORK

JUST OFF THE PRESS:

The

INSULATOR BOOK

1907 EDITION

This is a 64-page publication, devoted exclusively to High Voltage Insulators and Transmission Line Fittings, and will be sent to Engineers, Operators and Contractors upon request.

The Locke Insulator Mfg. Company

VICTOR, N. Y., U. S. A.

Direct Acting Limit Inverse Time Element

The name tells the story, the illustration shows the instrument—a single pole I-T-E Circuit Breaker with Direct Acting Time Limit attachment.

It responds immediately to short-Circuits, opens quickly on very heavy overloads, but is actuated by light overloads only when they are continued for a considerable period. These qualities render it particularly suitable for the protection of power feeders and large motors.

The DAL-ITE is made for all classes of service to which Time Limit Circuit Breakers may be adopted.

THE CUTTER COMPANY

Office and Factory

Nineteenth and Hamilton Streets, Philadelphia

SALES OFFICES

THE CUTTER COMPANY, 120 Liberty Street, New York.
THE CUTTER COMPANY, Marquette Building, Chicago, Ill.
THE CUTTER COMPANY, Machesney Building, Pittsburg, Pa.
W. S. HILL ELECTRIC COMPANY, 156 Pearl Street, Boston.
JOHN R. COLE, 766 Folsom Street, San Francisco.
I-T-E ELECTRIC COMPANY, 20 Great Russell St., London, W. C.

ELECTRICAL WIRE AND CORDS

GERMAN SILVER RESISTANCE WIRE

BARE AND INSULATED ELECTRICAL CORDAGE SLEEVING

COPPER MAGNET WIRE

BARE AND TINNED COPPER WIRE

SMALL FIELD WINDINGS MADE ON AUTOMATIC MACHINES

BELDEN PRODUCTS ARE ALWAYS RELIABLE
SEND FOR BELDEN CATALOG

BELDEN MANUFACTURING COMPANY
192 MICHIGAN STREET CHICAGO

Hello! Hello!

DETROIT INSULATED WIRE CO.
DETROIT, MICHIGAN?

Yes!
How soon can you ship
Twisted Pair Drop Wire
For Telephones?
RUBBER INSULATED?
Yes!
AT ONCE.
Take our order, please.

Here's Where We Get Busy.
Try it on. Our Wire is right;
So are the prices.

DETROIT INSULATED WIRE CO.
DETROIT, MICHIGAN

H AND H AND D E
INSULATED
WIRES & CABLES
UNDERGROUND TRANSMISSION
UNDER ANY VOLTAGE
DIELECTRIC CO. OF AMERICA
BELLEVILLE, N. J.

HAZARD STANDARD
Rubber Covered, Weather Proof
Wires and Cables
MAGNET, OFFICE, ANNUNCIATOR WIRE
HAZARD MANUFACTURING COMPANY
WILKESBARRE, PA.
OFFICES AND WAREHOUSES NEW YORK PITTSBURG CHICAGO

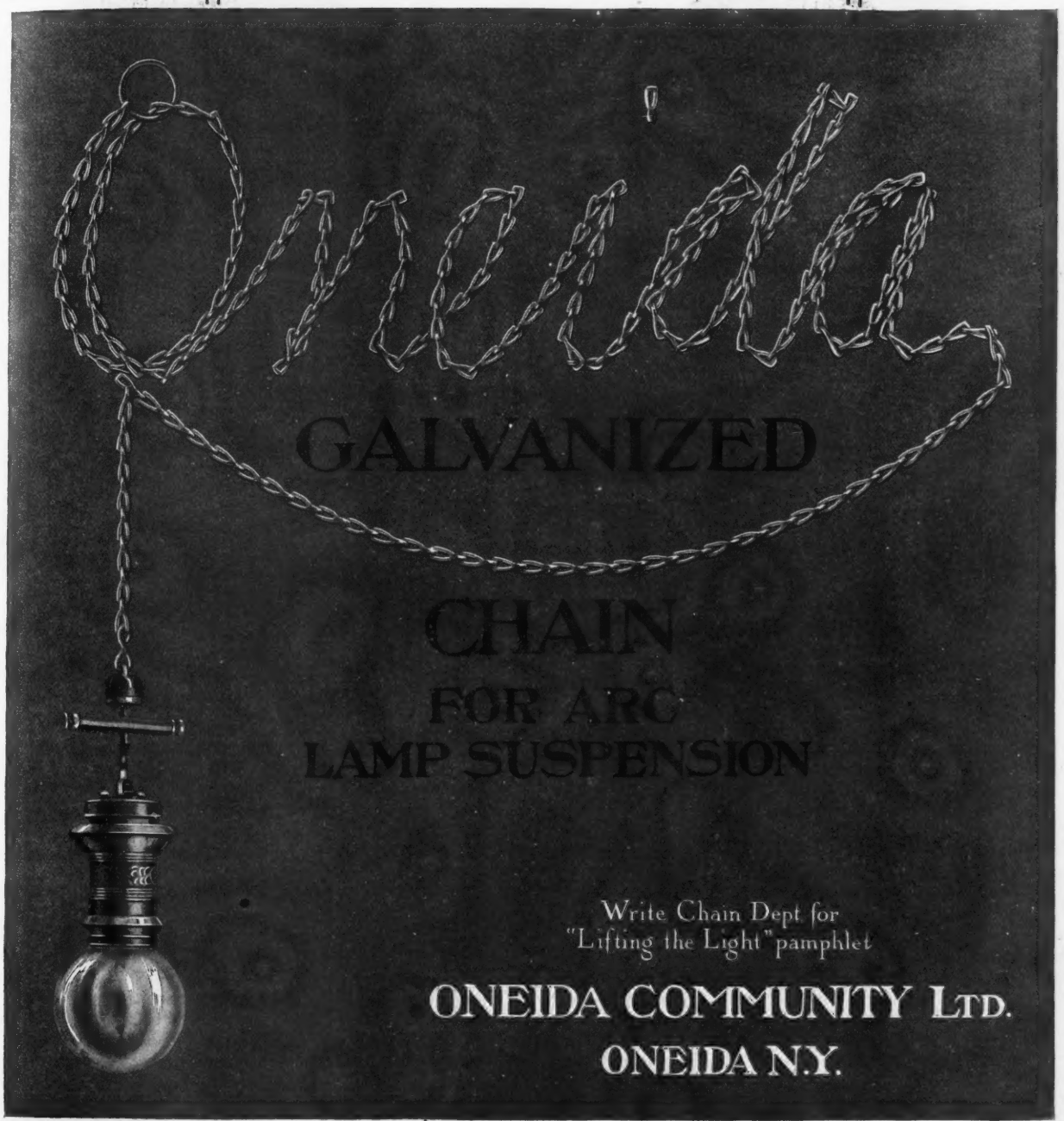
WINDING MACHINERY
FOR INSULATING WIRE
American Insulating Machinery Co.
N. W. Cor. Hancock and Oxford Streets
PHILADELPHIA, PA.

AMERICAN SEWER PIPE CO. CONDUITS
The largest manufacturers of glazed earthenware in the world.
General Offices, PITTSBURG, PA.

WHEN ANSWERING ADVERTISERS PLEASE MENTION THIS PAPER

H. N. FENNER, PRESIDENT J. F. BLAUVELT, AGENT RUSSELL W. KNIGHT, TREASURER

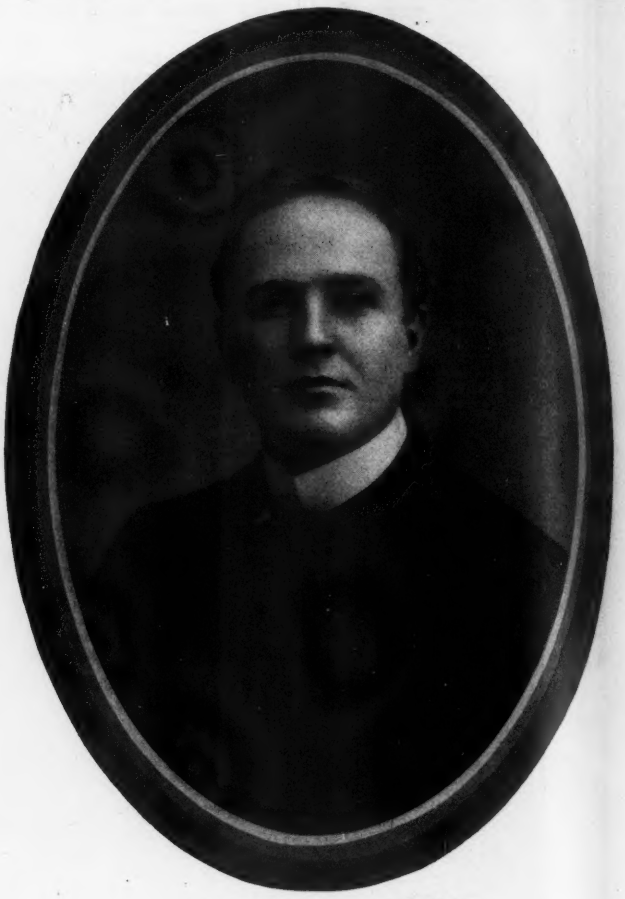
NEW ENGLAND BUTT COMPANY
MANUFACTURERS OF
MACHINERY FOR INSULATING ELECTRICAL WIRES
Braiding, Taping, Winding, Twinning, Cabling, Stranding, Polishing and Measuring Machines. Cable Covering Braiders
FINE CASTINGS A SPECIALTY
304 PEARL STREET, - - - PROVIDENCE, R. I., U. S. A.


Oneida
GALVANIZED
CHAIN
FOR ARC
LAMP SUSPENSION
Write Chain Dept. for
"Lifting the Light" pamphlet
ONEIDA COMMUNITY LTD.
ONEIDA N.Y.

Central Station

Mr. FRED A. CURTIS

President and General Manager of our company, the originator of the Curtis plan of direct-by-mail advertising services.



Mr. CHARLES A. PARKER

Secretary, Editor of the *Booster*, originator of much of our electrical advertising, and the advertising we have issued in connection with the Co-operative Electrical Development Association.

This is the first of a series of "reason why" advertisements which we shall publish in the ELECTRICAL REVIEW by which we purpose to acquaint you with some important Becauses respecting our company, our methods, our facilities and our ability to serve Central Stations in an advertising capacity.

We want you to know something first of the "personnel" of this company.

We want you to know that we are not a "Great-I-Am" concern.

Our policy is to *co-operate with* our customers—not *dictate to* them.

We want you to know also that we are not a "One Man" concern.

On the contrary we are a 100-man concern—an organization of "high efficiency" brains and skill specially equipped to take care of the Advertising and New Business Campaign of Central Stations, Electrical manufacturers and jobbers.

We have two reasons for publishing these photographs of four men who constitute our own "New Business" Department.

First—because we want you to *know* these men—we want you, at your convenience, to meet them face to face—to hear from them, personally, the story of our peculiar ability to serve you.

Will you not let us hear from you as to *when* you would like to meet one of these men?

Second—because we want to emphasize an important fact;—our organization is not (as some are) top heavy on selling and light weight on "delivering the goods."

These four men, who constitute the backbone of our business-getting department, are, every one of them, themselves producers of advertising, men of ideas, thinkers, men who can *help you to plan* for the best results from your advertising campaign.

We do not rely on high-salaried spellbinders to get business and low-priced brains to make the advertising.

When you engage an attorney or engineer, you certainly inquire into his past reputation and success, and, as near as you can estimate, decide whether or not he is capable enough to carry out for you the work you desire done. Don't you?

You are no doubt interested in advertising and new-business-getting ideas for your business?

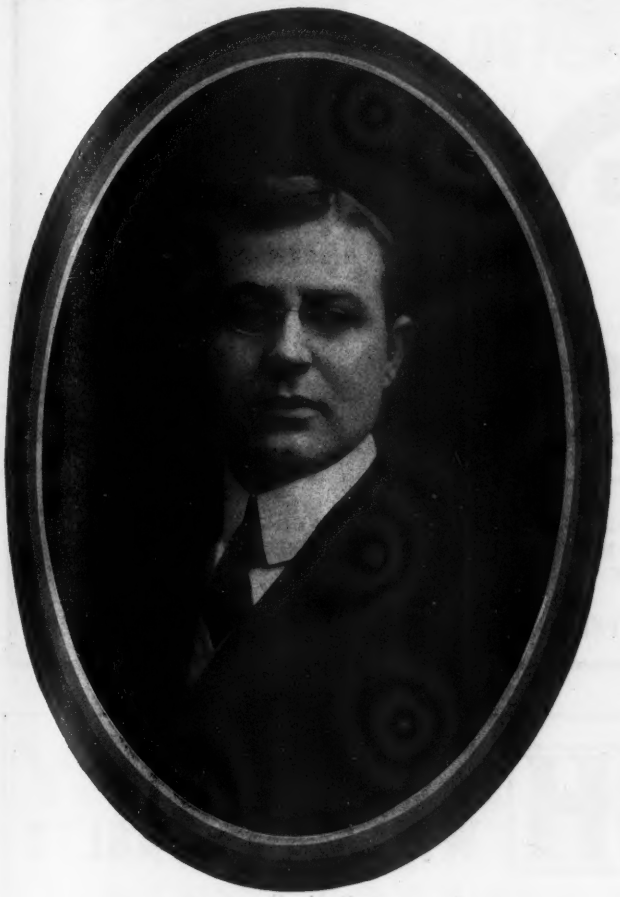
Doesn't it sound rational that the advertising concern most familiar with the conditions and requirements of your

Co-operating with the

Co-operative Electrical Development Association

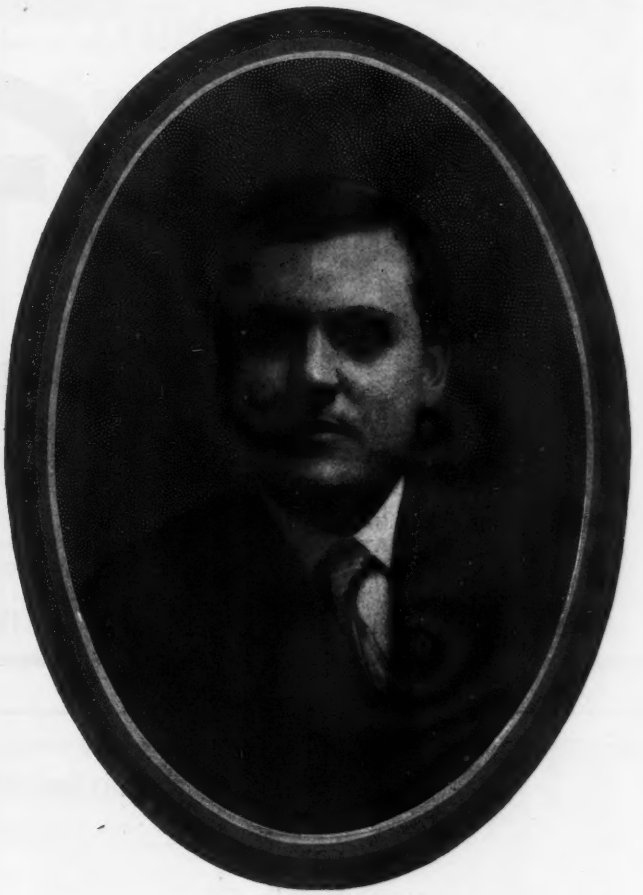
CURTIS

Business Boosters



Mr. C. H. JOHNSTON

Vice-President of our company, well known among the electrical fraternity, and thoroughly well posted on what our central station customers are doing in their new-business departments.



Mr. F. C. MATHEWS

Assistant General Manager, who is supervising the central station advertising we are now doing for Mexico City, Mexico; Buffalo, N. Y., and others, and originator of much of the advertising we are making for electrical manufacturers and central stations.

business will give you the best results?

Is it not true, therefore, that you would prefer to purchase advertising matter from *this* company which handles twice as much Central Station and Electrical Advertising as all other advertising concerns combined?

Reason it out and we believe you will agree with us that we can render you the most efficient advertising service.

At the head of every department connected with our business we have men who thoroughly understand Central Station requirements and who are well equipped to prepare advertising matter that is practical and productive.

For the last ten years we have been in very close touch with everything electrical.

We are, therefore, thoroughly familiar with your business conditions and are able to outline for you a campaign of advertising that will be economical and profitable.

"From brains to post office" your campaign may be handled by us so that all the details are taken off your hands.

At your command, we have about one hundred people divided into some eight different departments.

Your matter goes from Sales Department to Idea Department, Idea Department to Copy Department, etc., etc., until it reaches Uncle Sam's post office stamped and addressed.

All the idea making, copy writing, designing, printing, bindery work, addressing and stamping is done in our plant, and it takes more than twelve thousand square feet of space to accommodate us at the present time.

Examine closely the advertising matter that comes to you now and you will find the mark of Curtis on the best of it.

Request us and we will give you the names of many Central Stations and Electrical manufacturers who will tell you that our advertising service is profitable and satisfactory.

Don't you think it would be a good idea to make an appointment with one of our company and talk the matter over?

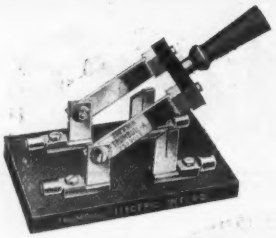
We believe you will find it quite satisfactory to discuss new-business-getting ideas with a man who is well posted and thoroughly acquainted with the requirements of Central Stations.

Why not write us now, making such an appointment, setting your own time and date?

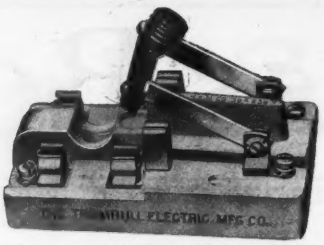
We shall be glad to send you our "Short Cut Book" upon request.

S ADV. CO.

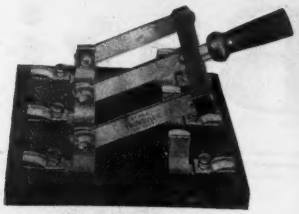
OFFICE AND PLANT
DETROIT, MICH.



TYPE "A" SWITCHES



N. E. C. COMBINATION SWITCHES



TYPE "C" SWITCHES

THE TRUMBULL ELECTRIC MFG. CO.

WRITE FOR CATALOG

WRITE FOR DISCOUNTS

PLAINVILLE, CONN.

OUR SWITCHES IN RECENT TESTS IN HEATING, SHOW A RISE IN TEMPERATURE OF FROM 25% TO 50% BELOW THAT ALLOWED BY THE UNDERWRITERS IN BOTH FULL LOAD AND OVERLOAD IN SOME CASES 100% BELOW THAT ALLOWED

CONSIDER WHAT THAT MEANS

THINK OF THE OVERLOAD THEY WILL CARRY WITHOUT INJURY

College, School and University Specials

Specialties in these lines. Have many designs we can submit—ask for them.

ECONOMY tables and cases are the best on the market. Investigate, then invest. You will find them above expectation.

Send for information.

Economy Drawing Table Co.
1306 Utah Street
TOLEDO, - OHIO

HABIRSHAW WIRES AND CABLES

The India Rubber and Gutta-Percha Insulating Co.

SALES OFFICE, 253 BROADWAY, NEW YORK
OFFICE AND FACTORY, GLENWOOD WORKS, YONKERS, N. Y.

In the HEART of the
NEW ELECTRICAL CENTER OF NEW YORK

THE BEST EQUIPPED ELECTRICAL SUPPLY STORE

STANLEY AND PATTERSON

23 MURRAY STREET 27 WARREN STREET
(FROM BLOCK TO BLOCK)

VACUUM DRYING AND IMPREGNATING APPARATUS

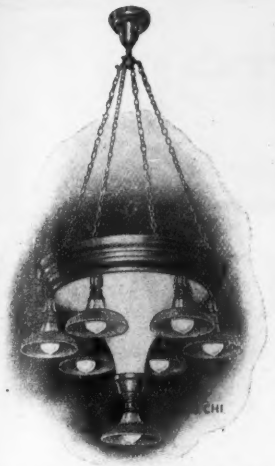
Electric Cables
Armatures
Emil Passburg System
Passburg Patents
Field Transformers
Magnet Coils

J. P. DEVINE CO.
314 Mooney-Brisbane Bldg. Buffalo, N. Y.
Over 700 apparatuses in use.

D & W FUSE COMPANY

PROVIDENCE, R. I.

Enclosed Fuses and Cut-Outs · Deltabeston Magnet Wire



No. 501 Cluster with Chain Hanging Rig.

MERIDIAN

LAMP CLUSTERS

FOR

Office
Store
Cafe
Hotel
} Lighting

Combine best features of incandescent and arc lighting; inexpensive, easy to install.

WRITE FOR BULLETIN 63

FEDERAL ELECTRIC COMPANY

127 W. Lake Street CHICAGO

EASTERN AGENTS

FEDERAL SIGN SYSTEM ELECTRIC

317 W. 42ND STREET NEW YORK

The Hartford Time Switch

Approved by FIRE UNDERWRITERS' INSPECTORS

Illustrating 10 to 50 amp. Single and Double Pole, and 10 to 35 amp., Single, Double and Triple Pole Switch.

THROWS CURRENT ON OR OFF AND GIVES LIGHT WHEN NEEDED, WITHOUT WASTE

It is Absolutely Weather-proof

A WEEKLY WINDING
the only attention required

TYPE B—On and Off daily
TYPE C—On and Off daily, omits Sundays
TYPE D—On and Off twice daily
TYPE E—For Electric Light Pole Control

Hartford Time Switch Company

99 Warren Street
New York

METER TALK

No. 4

Last week we received the following letter from Mr. Livingston Wingate of Indianapolis, Indiana:

INDIANAPOLIS, IND., Feb. 12, 1907.

DUNCAN ELECTRIC MFG. CO.,
Lafayette, Ind.

Gentlemen:

I have just returned from a trip to the Yukon and Alaskan gold fields, and wish to express my delight at what I saw one evening at Whitehorse, Yukon Territory.

Upon entering a store to make a purchase, I noticed an electric meter on the wall near to where I stood, and upon looking at it closely, through curiosity, I noticed that it was made in my own good old state of Indiana. The name plate bore the title: "Duncan Integrating Wattmeter, Manufactured by the Duncan Electric Mfg. Co., Lafayette, Indiana."

It was just like meeting an old friend in that distant land, and it made me proud to know that Indiana's products were even to be found in the ice-bound regions of the far North.

I told the proprietor of the store about my unexpected and pleasant surprise, and that these meters were made in my home state; and to which he replied: "You ought to be proud of them, as they have never given us any trouble, and they are looked upon as being the only HONEST thing we have in the whole town."

I thought the foregoing would interest you; and complimenting you upon the evident success of your meters, I am, Yours very truly,

LIVINGSTON WINGATE.

Duncan meters are adapted to all temperatures and climes. They are entirely free from sulphuric acid, alkaline solutions, mercury, or other liquids; consequently they do not have to be wrapped in a blanket in cold weather, and kept on ice in summer time.

DUNCAN ELECTRIC MFG. CO.

LAFAYETTE, IND.

Easophones

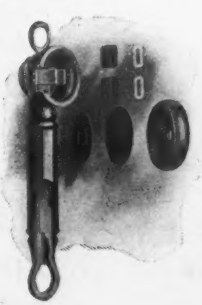
The WIRE and TELEPHONE COMPANY of AMERICA
ROME, N.Y.

Long Distance HAND TELEPHONE

LOWEST MAINTENANCE COST

Solid Metal Frame inclosed in vulcanized hard rubber

ONLY NINE EXPOSED PARTS



NO EXPOSED CONNECTIONS

PRACTICALLY INDESTRUCTIBLE

LET US SEND SAMPLE EQUIPMENT

WRITE FOR BULLETIN No. 101 GIVING FULL INFORMATION . . .

HENRY L. DOHERTY
& COMPANY

Bankers

Purchasers and Operators of Gas and Electric Properties

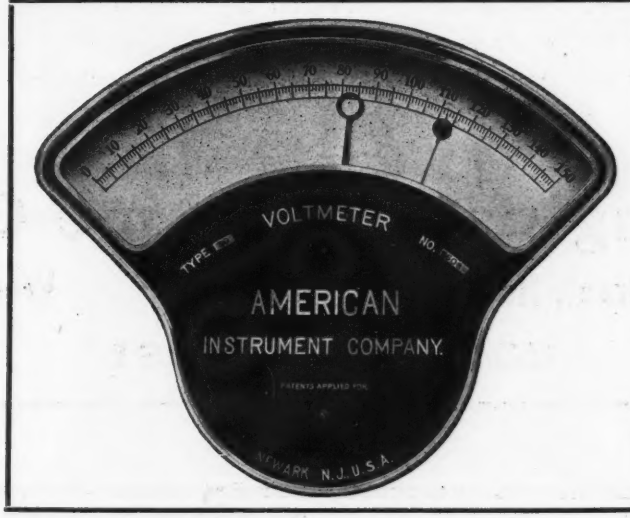
SIXTY WALL ST., NEW YORK, N. Y.

American Instrument Co.

James G. Biddle, President — A. O. Benecke, Chief Engineer

"AMERICAN" "SEMI-FLUSH" TYPE 3 INSTRUMENTS

"American" Shunts are Inter-changeable



"American" Shunts are Inter-changeable

A New Style of Switchboard Instrument

In the illustration is shown our new "semi-flush" type of switchboard instruments. They are of large size, having scales about 14 inches long, and are particularly well adapted for use with generators of large capacity.

The semi-flush characteristic of Type 3 Voltmeters and Ammeters is new and unique. It makes it possible to get the practical advantages of an instrument projecting but slightly beyond the face of the switchboard, and at the same time not weakening the board so greatly as is the case with the full-flush type so generally used heretofore. To accomplish these desirable results we make the case so that the part containing the moving system is about 6½ inches in diameter, and it alone extends through the board. The remaining part of the case, containing the scale, etc., is less than 2 inches deep and lies flat against the front of the board. Thus only a comparatively small hole in the board is required. It is circular and easily cut. The scale is very easily illuminated from the front.

In the general characteristics of construction, Type 3 instruments are thoroughly "American," being exactly similar to Types 1 and 2. The cases are positively and permanently dustproof, ammeter shunts are interchangeable, and the whole construction is very rugged—suited to stand the hardest kind of service.

For work requiring instruments of larger size than Type 2 we unhesitatingly recommend our new Type 3, and would ask that you get acquainted with them, through actual use, at the very first opportunity. Write to us for further details regarding ranges and prices.

If you don't already have a copy of Illustrated Catalog 64, write for it now

JAMES G. BIDDLE, General Sales Agent

1114 Chestnut Street, - - PHILADELPHIA, U. S. A.

FACTORY	T. G. SEIXAS	A. B. WEEKS	HOLABIRD-REYNOLDS ELEC. CO.
16 LAWRENCE ST.	SINGER BLDG.	5628 JACKSON AVENUE	116 EAST 5TH STREET
NEWARK	NEW YORK	CHICAGO	LOS ANGELES

SPEAKING OF REPAIRS

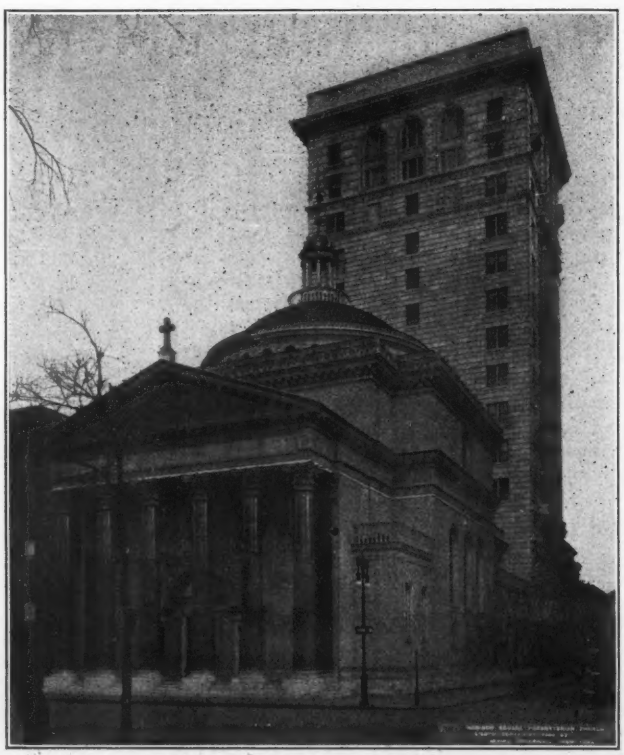
The Engineering Department of one of the best known architects in Cincinnati, speaking of the elevators which we had installed in a building in that city, writes:

"The machines are giving very satisfactory service and require very little attention. We ordered from you a number of duplicate parts, such as brushes, contacts and brake shoes, but have had no reason to replace any of these parts, though the machines have been working under severe service for the last year."

Marine Engine & Machine Company

Office: 126 Liberty Street, New York **Works: Harrison, N. J.**

NOT IN THE TRUST



MADISON SQUARE PRESBYTERIAN CHURCH
METROPOLITAN LIFE INSURANCE BUILDING ANNEX

India Rubber & Gutta Percha Insulating Co.

HABIRSHAW

Red Core Wire Used Throughout

Offices:
253 Broadway
Postal Bldg.

Works:
Yonkers
N. Y.

TYPE "G" CONTROLLER

TYPE G CONTROLLERS were designed to meet the demand for a moderate priced self-contained controller from 1 to 50 H. P., where the service is not severe enough to demand the use of our well-known DINKEY VENTILATED CONTROLLER

CONSIDER THESE POINTS OF SUPERIORITY

Heavy and durable wearing parts
Powerful and effective blowout
Accessibility and interchangeability of parts
Either cast grid or coil type of resistance which can be removed from the controller in a complete unit
Separate grids or coils of resistance are easily removed without disassembling the unit
No fibre used for insulation material

Send for Bulletin No. 107, giving details of construction

THE ELECTRIC CONTROLLER AND SUPPLY CO.

CLEVELAND, - - OHIO

OKONITE
TRADE MARK
REG. U.S. PATENT OFFICE.

The Standard for Rubber Insulation

If you cannot control the course of the electric current, the value of even the best electrical apparatus is lost

Use Okonite and you will secure the service you have a right to expect from an Insulated Wire

THE OKONITE COMPANY, Limited

253 Broadway
New York

ELECTRICAL SUPPLY HOUSES OF THE UNITED STATES

"Established Standards for QUALITY"

SUPPLIES

APPARATUS POLES SPECIALTIES
CROSS ARMS

LINE MATERIAL

ARC LAMPS FAN MOTORS

Our widely scattered supply stocks, each complete in every detail, make it possible for us to afford you, no matter your location, prompt and efficient service.

CONSULT THE MAP

WE SOLICIT YOUR INQUIRIES

Western Electric Company

Chicago New York Philadelphia Pittsburg Atlanta St. Louis Des Moines
Omaha Denver Kansas City Indianapolis Salt Lake City Cincinnati (Standard Electric Co.)
St. Paul (American Electric Co.) San Francisco (California Electrical Works) Los Angeles (California Electric Co.)

W. R. Ostrander & Co.

Manufacturers and Dealers in

Electrical Supplies

Bells
Batteries
Annunciators
Speaking Tubes
Push Buttons
Tell Tale Floats
Tin Shades

Enameled Iron Conduits
Wire and Cables
Incandescent Lamps
Porcelain Insulators
Porcelain Tubes, Etc., Etc.

OFFICE and SALESROOM:
22 Dey Street, New York

FACTORY:
1431-1441 DeKalb Avenue, Brooklyn, N. Y.

Write us for prices

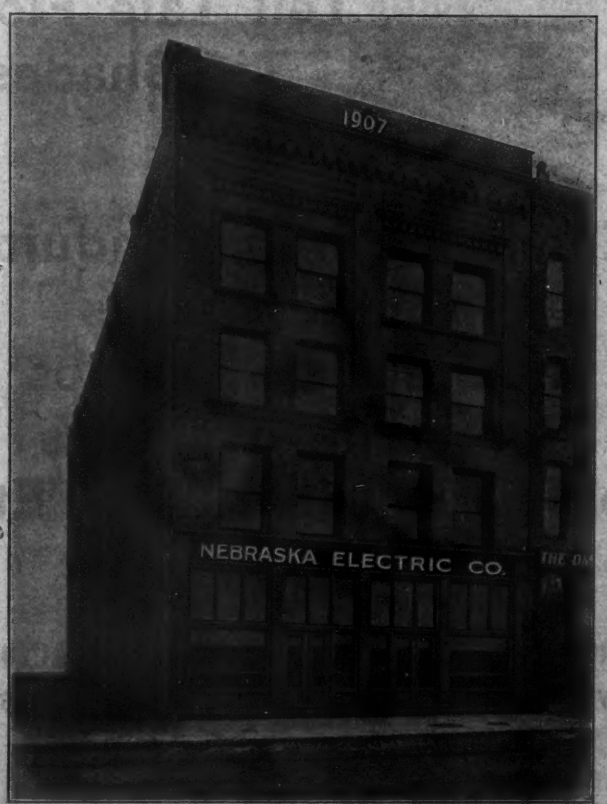
Announcement

1903

Omaha, Nebr., February 20, 1907.

WE are pleased to announce that on the first day of March we will remove to our new location at 1207 Harney Street. We take this opportunity of expressing to our patrons our appreciation of the hearty support which has enabled us to make the progress that is indicated by the necessity for additional space which compels us to move. Very respectfully,

Nebraska Electric Company



NEW LOCATION, 1907

Four Mesco Specials

Red Seal Dry Battery

For all work requiring a high-grade battery, the Red Seal will be found to give longer life and more satisfactory service that any other cell on the market.

Specially designed for Ignition and Telephone Work

Made to meet the demand for "something better" in the dry-battery line.

Life, Service and Recuperation are the vital tests in which a battery must make good. These three points, together with honest construction and a perfect combination of the highest quality of energy-producing elements, pronounce the Red Seal the BEST dry-battery on the market—barring none.

Price, 25 cents.

SPECIAL PRICES FOR QUANTITIES.

Avery Testing Galvanometer

Always Tells the Truth

Far superior to the heavy, cumbersome instruments that weigh pounds where this one weighs ounces.

Small enough for the pocket—large enough for serious work.

The Avery Testing Galvanometer supplants the clumsy testing bell. It is extremely sensitive in locating leaks and is a practical instrument for measuring resistance.

Delicate parts in the make-up of this galvanometer have been omitted. Once the needle is locked, all the hard knocks in the world can't derange its adjustment or mechanism.

Battery can be easily renewed at small expense.

The advantage and value of the Avery Galvanometer to linemen lies in its accuracy and compactness. It fits in the pocket and is always ready for instant use.

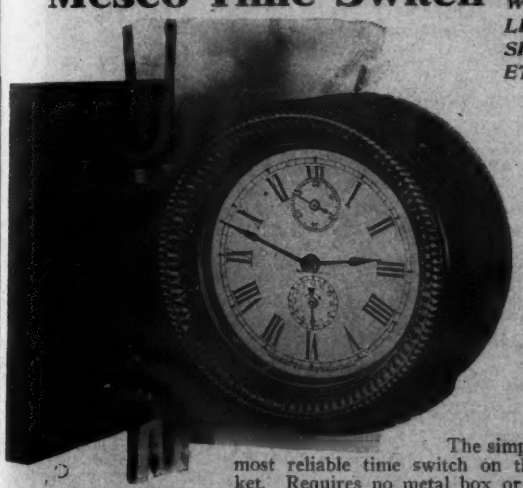
Weight complete, 8 ounces.

Catalogue No. 13395. $6.00.

WRITE FOR DISCOUNTS.

Mesco Time Switch

FOR WINDOW LIGHTS, SIGNS, ETC.



The simplest and most reliable time switch on the market. Requires no metal box or cabinet.

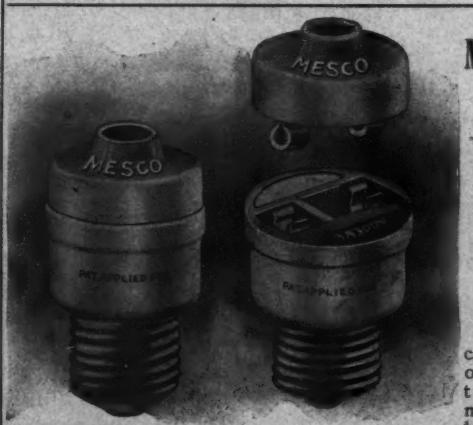
Just wind the clock, switch on lights, and they will be thrown off automatically at the time for which alarm is set.

A high-grade Seth Thomas clock movement and standard push-button switch are used.

The clock is exposed and if conveniently located will serve as a time piece also.

Knock-out holes are provided in slate base for concealed wiring.

Catalogue No. 16450, for throwing lights off only, 10 Amp., 250 V., D. P., $10.00. **WRITE FOR DISCOUNTS.**



Manhattan Separable Attachment Plug

N. E. C. S.

Both plug and cap are generously proportioned and made from the best grade of porcelain. Vulcanized rubber cap may be had, if preferred, in place of porcelain.

AMPLE AND POSITIVE CONTACT AREA is secured by our method of construction.

Spring contact clips are of phosphor bronze and hold the brass terminals securely.

The contact "well" in the plug is reinforced by a heavy division wall.

Our biggest and best argument is that it is the only separable plug which will separate at any angle. A pull on the cord in any direction will cause plug and cap to separate instantly without imposing the slightest strain on socket or cord, no matter how or where the socket is located, or supported. The value of our separable feature is best demonstrated where plug is inserted in wall socket and cord is apt to accidentally come in conflict with chairs, etc.

Cat. No. 18410, Porcelain Cap. 3 Amp. 250 V. Std. Pkg. 100. Price 30c each
" 18411, Rubber " " " " " 35c "

WRITE FOR DISCOUNTS.

Manhattan Electrical Supply Co.

NEW YORK
17 PARK PLACE—14 MURRAY STREET

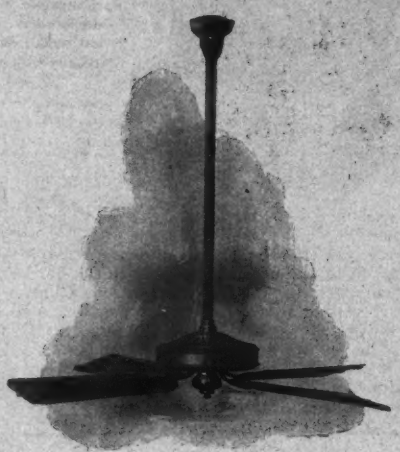
CHICAGO
100 FIFTH AVENUE

FACTORIES
JERSEY CITY, N. J.—RAVENNA, OHIO

UNDER THE BREEZE

—OF—

TUERK FANS



Type C—4-Blade

Type A—4-Blade

We carry a complete line of artistic and substantial alternating current Tuerk Fans for all purposes.

Send for descriptive catalogue and price-list.

Estimates relative to ELECTRICAL SUPPLIES of all kinds will be gladly furnished upon application for same with specifications.

We have always at hand a full line of IMPERIAL ARC LAMPS which are extensively used throughout the country; also a big stock of BRILLIANT INCANDESCENT LAMPS for immediate shipments, and PORCELAIN SIGN LETTERS.

E. B. LATHAM & CO.

ELECTRICAL MACHINERY AND SUPPLIES

BROADWAY AND MURRAY STREET NEW YORK, U. S. A.

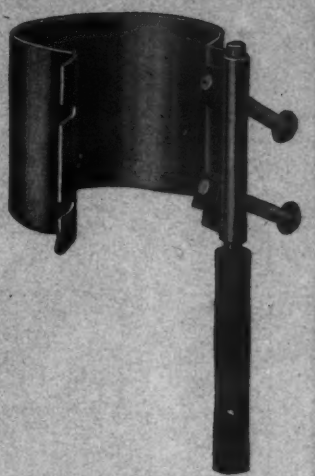
A PERFECT CONTACT WITH THE PIPE

"O.K." Ground Clamps

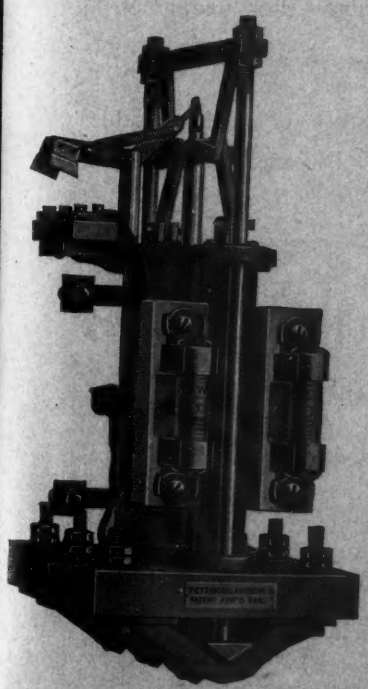
Made of stamped spring copper, are the easiest to install and make the best contact of any ground clamp on the market. Protection to life and property demands that secondary house wires, iron conduit and lead cable sheathes be grounded.

WRITE US FOR SAMPLE

Approved by the Underwriters' National Electric Association



A PERFECT CONTACT WITH THE GROUNDING WIRE

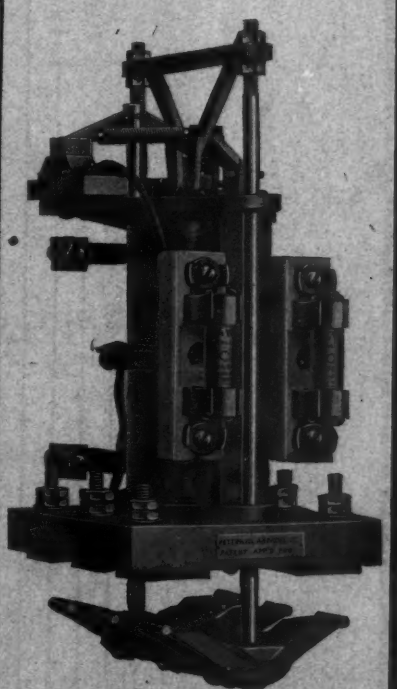


CLOSED

Type D-2
Remote Control Switch

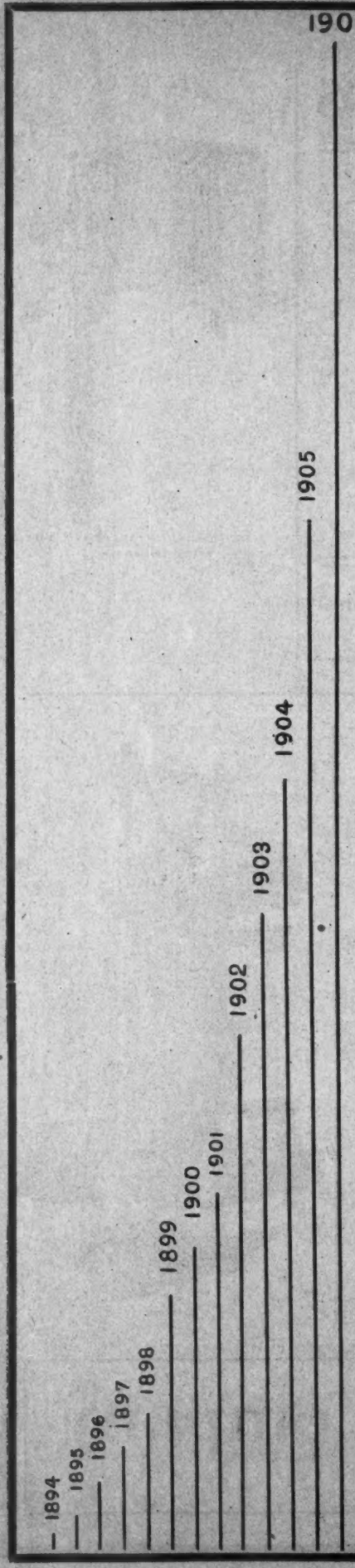
Up-to-date methods in mill, theatre and auditorium wiring, that include economy, convenience, simplicity and safety, are made possible by the use of Remote Control Switches. Let us tell you of the many ways in which this switch may be used.

Approved by the Underwriters' National Electric Association



OPEN

Pettingell-Andrews Company
Boston, Mass.



The diagram shows our relative volume and increase of business for the years 1894 to 1906 inclusive.

Strict adherence to the principle of a square deal for everybody has been our policy from the beginning of our business career, is now and always will be.

It satisfies our customers, pleases the people from whom we buy, and pays us.

It has earned for us the sobriquet of "old reliable" and given us the credit of being Philadelphia's leading electrical supply house.

FRANK H. STEWART ELECTRIC CO.
35 NORTH SEVENTH STREET
PHILADELPHIA, PA.

A SAFE ELECTRICAL INSTALLATION

For Light and Power is Assured
Only by the Use of High - Grade Material

MINIMIZE YOUR FIRE RISKS
By the Use of OKONITE WIRE for the Leads

Griptite One-Piece Clamps

(National Code Standard)

For Ground Connections

AND

HOLTZER - CABOT ELECTRIC COMPANY'S
DYNAMOS and MOTORS

FOR PRICES AND DISCOUNTS ADDRESS

Novelty Electric Company

MANUFACTURERS AND JOBBERS OF
ELECTRICAL MATERIAL
Philadelphia, Penna.

Representing
Okonite Company, Ltd.
Holtzer-Cabot Electric Co.

C. PHILLIPS HILL
President

G. BROWN HILL
Vice-President and Treasurer

H. G. SHALER
Secretary

ELECTRICAL SUPPLIES

DOUBLEDAY-HILL ELECTRIC CO.

Manufacturers and Dealers

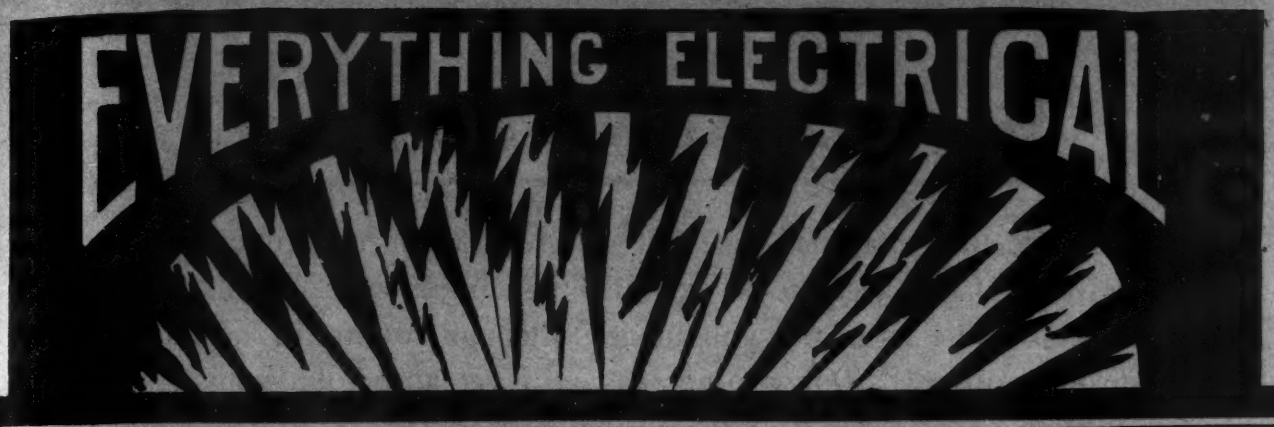
PITTSBURG, PA.

This Trade-mark guarantees all material furnished, also a broad, generous policy towards our customers.

One of the largest electrical supplies houses in the world. What we haven't, no one has. It takes a nine-story building and two large warehouses to carry all our stock.

HIGHEST GRADE LOWEST PRICES
QUICKEST DELIVERY

We manufacture Non-Combustible Armature and Field Coils, Switchboards, Trolley Wheels, Special Electrical Apparatus of all kinds.



DO YOU

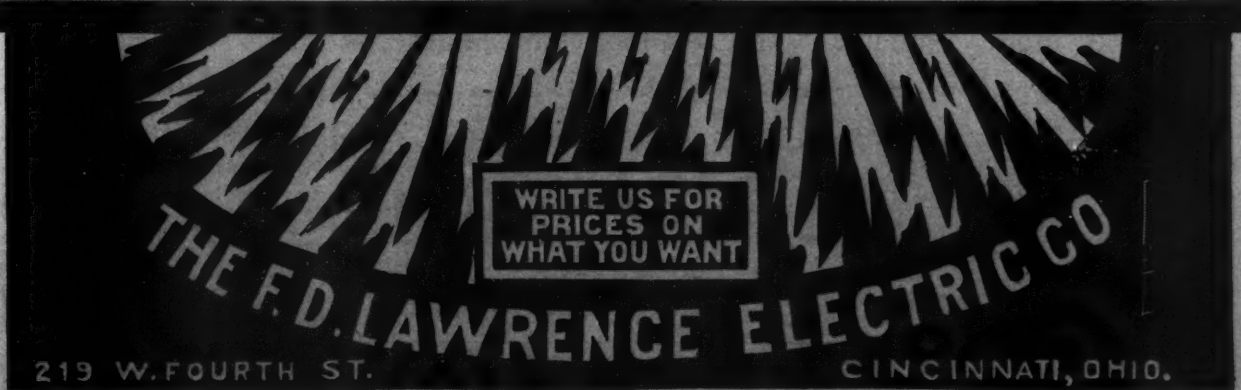
WANT THE BEST?
WANT PRICES THAT ARE RIGHT?
WANT GOOD SERVICE?
WANT THEM SHIPPED PROMPTLY?

We wish you would bear us in mind when in a hurry for anything in the line of electrical supplies. We have been of service to most people and hope we can be to you. Let us know what you want. If we haven't got it, nobody has. We have the largest stock in the country, and are adding to it constantly.

TELEGRAPH, TELEPHONE OKONITE TRADE MARK REG. U.S. PAT. OFFICE OR WRITE US

Okonite Wires, Okonite Tape, Manson Tape, Gandee Weather-Proof Wires.

"Flexduct" Noark Fuses and Blocks, made by H. W. Johns-Manville Co.
"Femco" and Columbia Incandescent Lamps. G. I. Arc Lamps. Columbia Dry Batteries, made by National Carbon Co. Sampson Batteries, made by the Electric Goods Mfg. Co.
Bossert Boxes and Supplies. H & H and Hart Switches.



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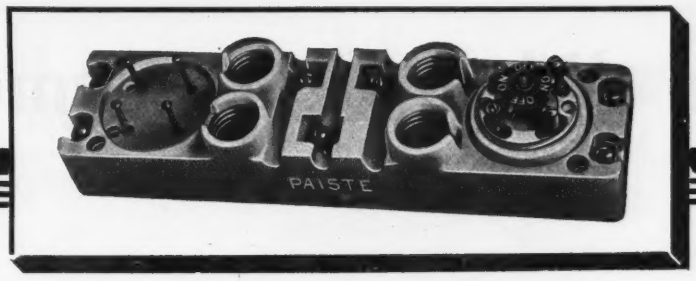

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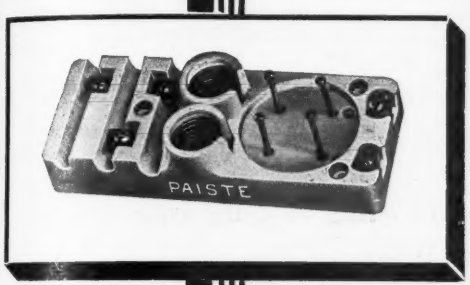

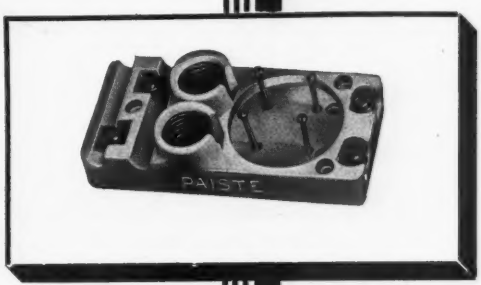

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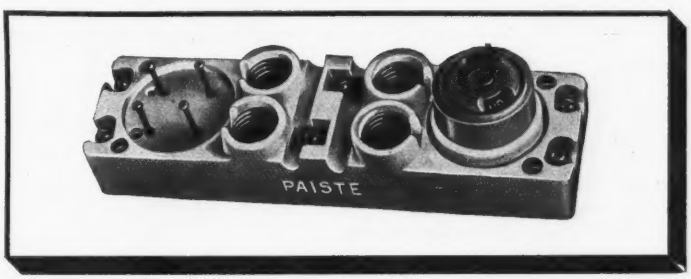

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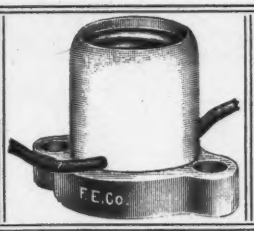

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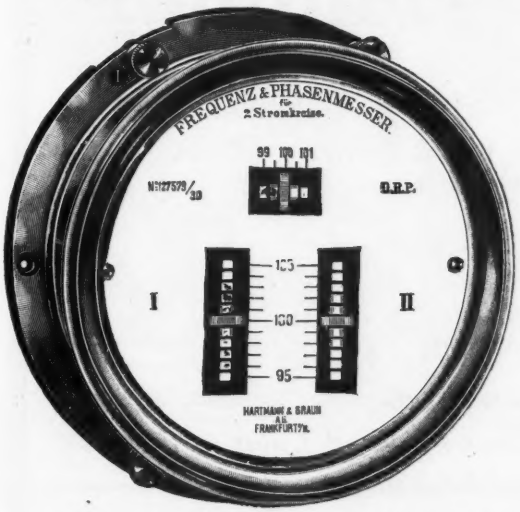

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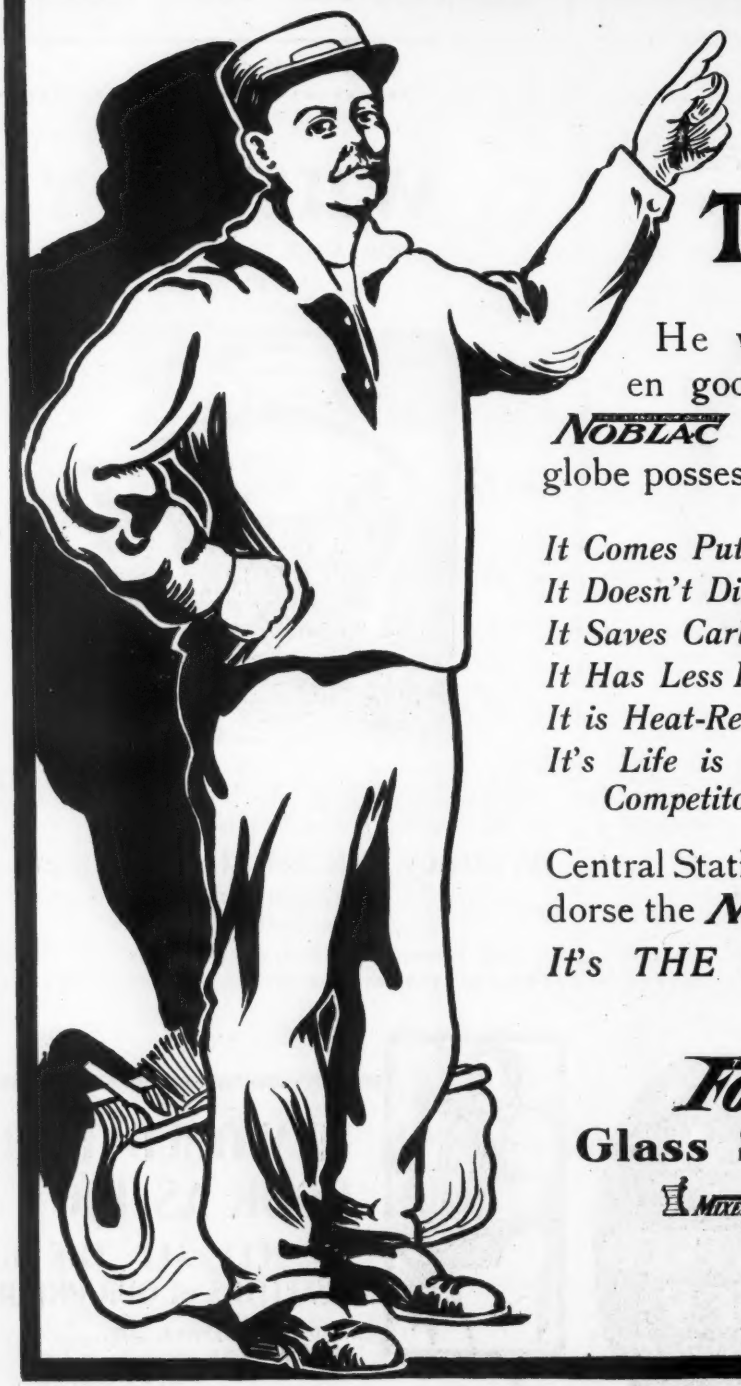

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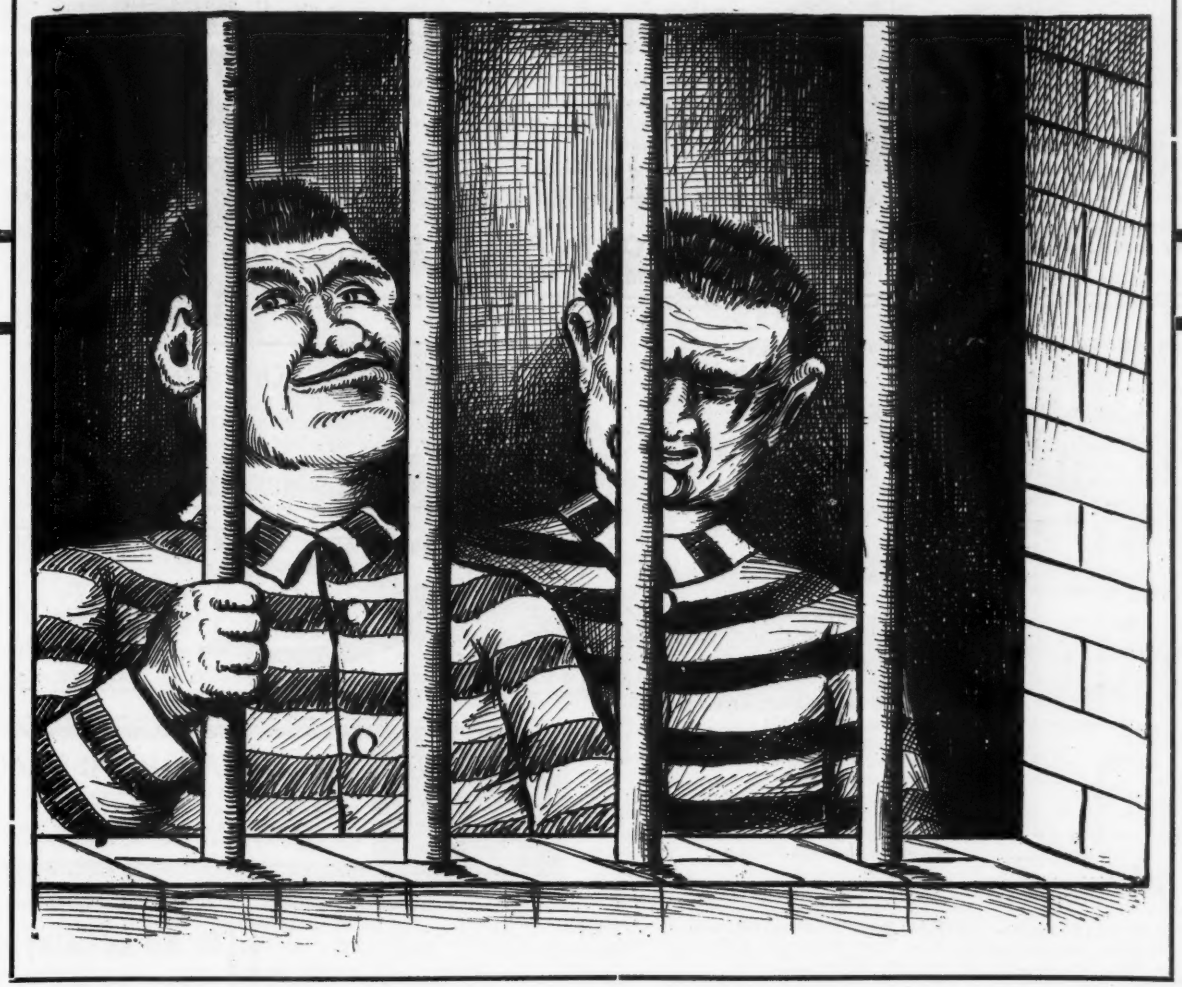

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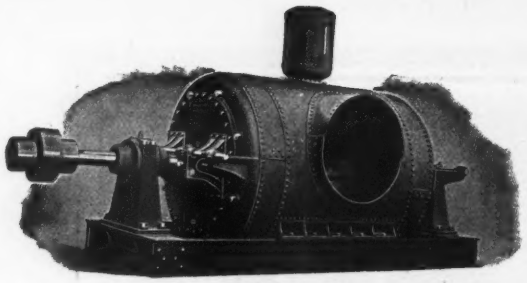

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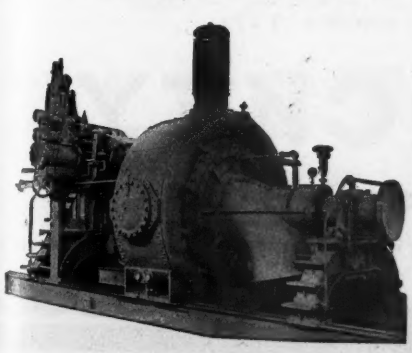

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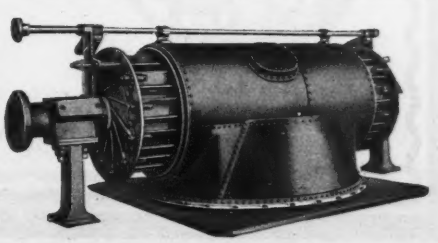

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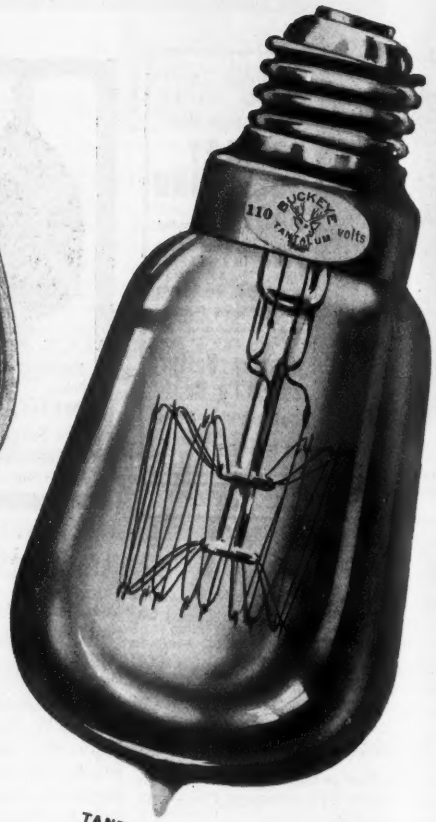

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BUCKEYE GEM BUCKEYE STANDARD BUCKEYE TANTALUM

Each one of Superior "Buckeye Quality"

WE ARE STILL IN A POSITION TO GIVE YOU PROMPT SHIPMENTS ON ALL REGULAR TYPES OF BUCKEYE STANDARD CARBON LAMPS. Our facilities for turning out Buckeye Lamps in large quantities are of the best, our labor is of the highest skill and the material we use is the best that money can buy.

WE MAKE INCANDESCENT LAMPS OF EVERY KNOWN TYPE

THE BUCKEYE

Main Office and Works:

CHICAGO OFFICE, 23 East Lake Street
J. H. COOKE, Manager

PITTSBURG OFFICE, 1101 Empire Building
W. ENNES, Manager

We Make It Easy For You To Buy

BUCKEYE LAMPS

BUCKEYE STANDARD CARBON LAMPS are held in stock by the following jobbers:

Frank H. Stewart Electric Co., Philadelphia, Pa.
Dunham, Carrigan & Hayden Co., San Francisco, Cal.
The Post-Glover Electric Co., Cincinnati, Ohio.
Union Electric Co., Pittsburg, Pa.
Piedmont Electric Co., Anderson, S. C.
B. & C. Electrical Construction Co., Utica, N. Y.
Pettingell-Andrews Co., Boston, Mass.
Hide, Leather & Belting Co., Indianapolis, Ind.
The Western Gas Fixture Co., Toledo, Ohio
The Erner & Hopkins Co., Columbus, Ohio
The Royse Electric Co., Indianapolis, Ind.
Kokomo Electric Construction Co., Kokomo, Ind.
Machine Electric Supply Co., Muncie, Ind.
Louisville Electric Supply Co., Louisville, Ky.
Henry L. Walker Co., Detroit, Mich.
Geo. J. Lambrecht, Hannibal, Mo.
Butterworth & Reiter, Dayton, Ohio
O. J. Goettmann, Allegheny, Pa.
Dauphin Electrical Supplies Co., Harrisburg, Pa.
Springer & Patterson, Pittsburg, Pa.
Carter Electric Co., Pittsburg, Pa.
W. C. Teas, Chattanooga, Tenn.
Nebraska Electric Co., Omaha, Neb.
Chas. E. Sharp, Security Building, St. Louis, Mo., Special Agent Republic of Mexico

You can get as many as you want and as soon as you want from these jobbers, some of whom are located near to you.

ELECTRIC CO.

CLEVELAND, OHIO

NEW YORK OFFICE, 114 Liberty Street
ARTHUR ORGAN, Manager

DALLAS, TEXAS, OFFICE, 216 Commerce Street
H. E. WELLS, Agent

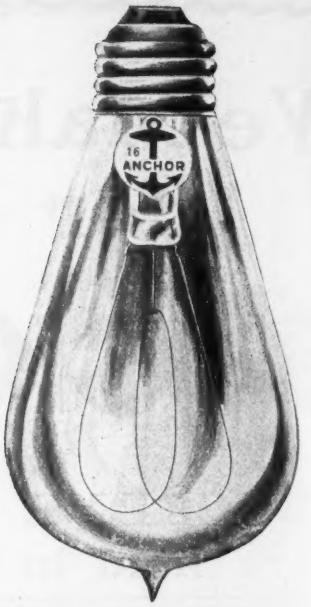
RENEWED CLASS A LAMPS

50% more lamps
for same money you pay
for other lamps of equal quality

Used by United States Navy

AGENTS WANTED

We buy burned-out lamps for cash



ANCHOR LAMP COMPANY

258 Broadway, NEW YORK

LOOK FOR THE LICENSE LABEL

The Pioneer Electrical Weekly

¶ The ELECTRICAL REVIEW bases this claim upon the fact that there was no other electrical weekly published in this country when it was established as a weekly journal. ¶ The ELECTRICAL REVIEW is not the result of any combination or consolidation. ¶ It is now and always has been published entirely independent of any technical journal combination or publishing syndicate.

13 PARK ROW ELECTRICAL REVIEW NEW YORK CITY
CHICAGO, 1513 Manhattan Building BOSTON, 95 Milk Street LONDON 42 Old Broad Street

BANNER LAMPS

make a bid for your lamp orders on but one basis---that of economy, true economy---meaning the most satisfactory lamp service at the lowest ultimate cost. Though Banner Lamps cost the same per lamp as others, you'll find that they cost less per year. May we tell *you* personally why this is so? Our line includes Tantalum and Banner GEM High Efficiency Lamps.

Buy Banner Betterness

LOOK FOR THE LICENSE LABEL

The Banner Electric Company

YOUNGSTOWN, OHIO

INDEPENDENT

INCANDESCENT

LAMPS

We are operating two large and well-equipped factories, and we are *independent* in every sense of the word.

We are manufacturers of the

ELK

NEW LAMPS

FACTORY EMPORIUM, PA.

"ELK"

.. NEW ..

LAMPS

AND THE

"NOVELTY" RENEWED LAMPS

NOVELTY

RENEWED LAMPS

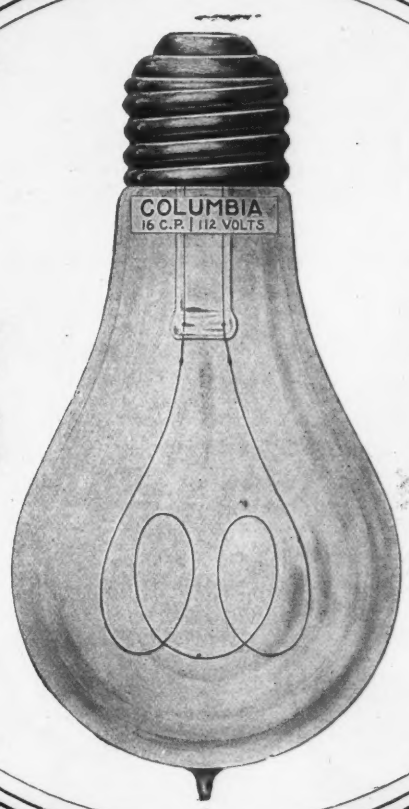
FACTORY ST. MARY'S, PA.

If you are a dealer, a consumer or central station, get our proposition. We are in business to stay. Our product is guaranteed in all ways.

Novelty Incandescent Lamp Co.

MAIN OFFICE **Emporium, Pennsylvania**

ALVIN & JACKSON, Western Sales Agents
502 Monadnock Block, Chicago, Ill.



Most Light

Least Cost

COLUMBIA LAMPS

HAVE STOOD FOR 17 YEARS as the Highest Type of Incandescent Lamp, and are generally recognized as THE Lamp that satisfies those who want the very best.

We are prepared to furnish all types of lamps, including special lamps, such as Tantalum, Gem Metallized Filament 50-Watt Lamps, Gem Metallized Filament High C. P., High Efficiency Units, Gem Crystal Lamps (Meridian Type), Street Series Lamps, the full line of Candelabra and Miniature Lamps.

THE COLUMBIA INCANDESCENT LAMP CO.

ESTABLISHED IN 1889

Main Office and Factory, 2115-17-19 Locust Street, ST. LOUIS, MO.

BRANCH OFFICES: New York, Taylor Building, 39-41 Cortlandt St. Philadelphia, 1221 Real Estate Trust Building
Chicago, 264-270 Fifth Ave. Memphis, 26 Randolph Building Mexico, Monterey—Sanford & Cia.

LOOK FOR THE LICENSE LABEL

YOU'RE THE MAN

who has not tried Boston Renewed Lamps

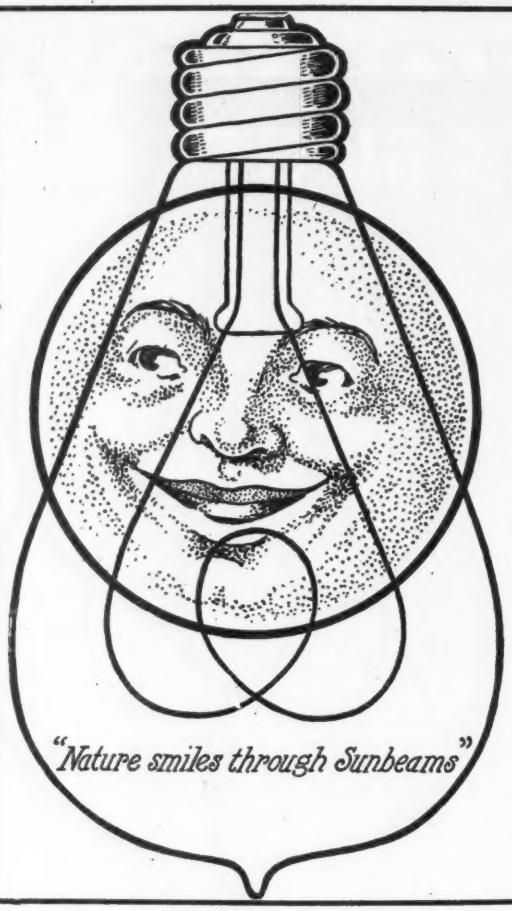
Why don't you anticipate your future needs and order the lamps of quality now?

LOOK FOR THE LICENSE LABEL

Boston Incandescent Lamp Co.

DANVERS, :: MASSACHUSETTS

"THE LIGHT THAT'S RIGHT"
STAR LAMPS
Have reached the crest of perfection
WRITE FOR OUR BOOKLET
"A LIGHT SUGGESTION"
Our Specialties:
Central Station
Mill Type
Twelve-watt Sign
Star Gem
Star Tantalum
High Efficiency Units
Miniature and Decorative Lamps
Especially well equipped to handle the large jobbing trade.
Write for exclusive agency before renewing your contract.
The Standard Electrical Mfg. Co.
NILES, OHIO.



This Shows How You Would Feel If You Used

Sunbeam Lamps

We Supply

Sunbeam Standard Lamps
3 1-2 Watts—1500 Hours Life

Sunbeam Gem Metallized Lamps
2 1-2 Watts—700 Hours Life

Sunbeam Tantalum Lamps
2 Watts—900 Hours Life

Write for Samples or Prices

Sunbeam Incandescent Lamp Company

Chicago New York Toronto

Prompt shipments from stock can be made by

Western Electric Company

CHICAGO NEW YORK PHILADELPHIA ST. LOUIS KANSAS CITY
DENVER SEATTLE PITTSBURG ATLANTA
SAN FRANCISCO (California Electrical Works) LOS ANGELES (California Electric Co.) ST. PAUL (American Electric Co.) CINCINNATI (Standard Electric Co.)

An Exponent of the Simple Life

OUR SPECIAL "MILL TYPE" LAMP was not made for fancy purposes, but for hard, every-day work in places where strenuosity exists in large quantities. The "MILL TYPE" has a filament as "solid as a rock," will stand vibration and rough usage in factories and at the same time "make good" all our claims as to quality and quantity of light. Factory managers have stamped it "100 per cent. good."

LOOK FOR THE LICENSE LABEL

Shall we send you a barrel for your own tests? We'll abide by your judgment.

Standard Electrical Manufacturing Co.

NILES, OHIO

GERMANIA LAMPS

are the lamps of

QUALITY
GERMANIA PRICES

are below those quoted by members of the combination.

WRITE FOR THEM

Germania Electric Lamp Co., 120 Liberty St., New York
420 Ogden St., NEWARK, N. J.

THE "FIREFLY" Automatic Motorless FLASHER

operates three 16, six 8, twelve 4 c.p. lamps or less on direct or alternating current.
Order a sample sent by mail on approval at trade discount and give it a thorough test.
In a metal box, LIST PRICE, $1.50 EACH. Liberal discount to the trade.
C. O. SCHNEIDER & CO., Manufacturers, 84 E. Adams St., Chicago, Ill.

The Sterling Special Lamp

We are specialists in the manufacture of

Low Voltage Tantalum Lamps

for use on all kinds of storage battery and dry cell work.

SEND US SPECIFICATION OF YOUR REQUIREMENTS

The Sterling Electrical Manufacturing Co.
DRAWER B, WARREN, OHIO

IT MAKES A DIFFERENCE

IN THE EXPRESSION OF A MAN'S FACE WHETHER HE IS CLINKING THE COIN SAVED BY USING

SHELBY 45-WATT USEFUL LIGHT LAMPS

OR PAYING FOR CURRENT CONSUMED BY ORDINARY 56-WATT LAMPS.

WE CAN SHOW YOU HOW TO SAVE AT LEAST $110.00 PER YEAR PER HUNDRED LAMPS. DOES THIS MEAN ANYTHING TO YOU?

THE SHELBY ELECTRIC COMPANY

Nos. 6 to 30 HIGH STREET, SHELBY, OHIO

LOOK FOR THE LICENSE LABEL

NEW YORK CHICAGO PHILADELPHIA BOSTON SAN FRANCISCO DETROIT ATLANTA

Brilliant

8.30 A.M.

Brilliant

LAMPS

Any Voltage
Any Candle
Power, for
Immediate
Shipment

LAMPS

Tantalum, Gem
Standard Tipped
or Tipless
We can serve
most efficiently

Try us on a rush order

ORDERS FOR BRI
ARE SHIPPED IMMEDIATELY

LOOK FOR THE LICENSE LABEL IN THE LAMP

THE BRILLIANT
Cleveland,

WE are able to announce that, after careful quality of lamps as to current consumption, deliveries and careful factory service, **Sweeten,** *Brilliant Lamps* in stock, having closed contract

FOR QUALITY--- ALL THE ELEMENTS THAT MAKE THE IANT LAMPS ARE SUPERIOR.

10.15 A.M.

LLIANT LAMPS

UPON RECEIPT OF ORDER

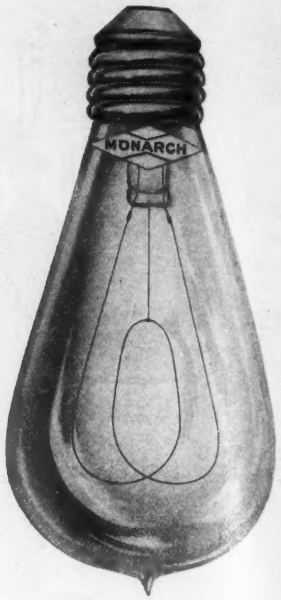
ELECTRIC COMPANY
Ohio, U. S. A.

investigation of the Lamp Market, which means useful life, selection, efficiency, promptness of **Crossan & Co.,** *816 Arch Street, PHILADELPHIA,* will carry in future for Philadelphia Agency on *Brilliant Lamps.*

HIGHEST GRADE OF INCANDESCENT LAMPS---THE BRILL-

THE BRILLIANT ELECTRIC CO., CLEVELAND, OHIO

JUST WHAT YOU'RE LOOKING FOR



LAMPS THAT GIVE
THE BEST LIGHT,
HAVE THE LONGEST LIFE.
LAMPS THAT ARE ATTRACTIVE
AND LIKEWISE THE MOST ECONOMICAL
AND SATISFACTORY IN EVERY WAY.

FOR MAINTENANCE OF CANDLE POWER THEY ARE UNEQUALED.

THAT'S THE "MONARCH"

THEY ARE THE EMBODIMENT OF HIGH QUALITY FROM SOCKET TO TIP.

DONT FORGET TO WRITE FOR PRICES.

LOOK FOR THE LICENSE LABEL IN EVERY LAMP

THE MONARCH ELECTRIC MFG. CO.
WARREN, OHIO.

E.R.

G.I.

STANDS FOR

GENERAL INCREASE

GENERAL INCREASE IN YOUR LAMP SALES
GENERAL INCREASE IN YOUR PROFITS

GREATER ILLUMINATION

THIS MEANS MORE LIGHT FOR THE SAME EXPENDITURE FOR CURRENT, HIGHER EFFICIENCY AND FULL RATED CANDLE-POWER

A GROWING INDUSTRY

ALL REPRESENTATIVES HAVE A STOCK

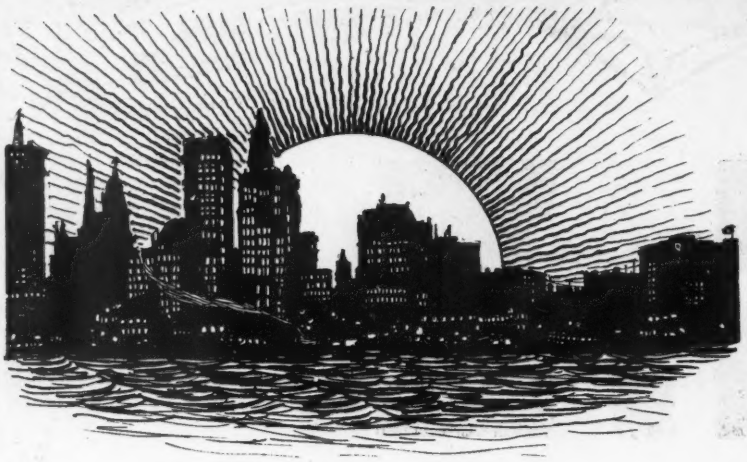
SPECIAL REPRESENTATIVES

M. B. Austin & Co., Chicago
Hendrie & Bolthoff Mfg. & Supply Co., Denver, Col.
Hobson Electric Co., Dallas, Tex.
Royse Elec. Co., Indianapolis, Ind.
Southern Elec. Co., Baltimore, Md.
Mountain State Elec. Co., Wheeling, W. Va.
Coast Electric Co., Oakland, Cal.
Crosby Craft & Co., Cleveland, O.
Frank Adam Electric Co., St. Louis, Mo.

General Incandescent Lamp Co.

Main Office and Works:

Cleveland, Ohio



AS THE SUN

SINKS OUT OF SIGHT

"EXCELLO SUNRAYS"

GIVE US LIGHT

SEEN EVERYWHERE

It gives a sun-colored or pearl-white light, and is suitable for either indoor or outdoor lighting.

CANDLE POWER, 1,500 to 3,000. Current consumption, 350 to 550 watts.

THE ADVERTISING POWER of this lamp is unequaled. It gives stores an individual appearance, and distinguishes them from the others.

The Light That Creates a Crowd

The lamp is so simple that anybody, without skill, can attend to it.

The great economy and reliability of this lamp has secured a vast number of important installations all over the country.

The workmanship is so perfect that we, with confidence, guarantee the mechanism against any ordinary wear and tear for one year.

Central stations should investigate them — they are money makers.

THE EXCELLO ARC LAMP CO.

26 East 21st Street, New York

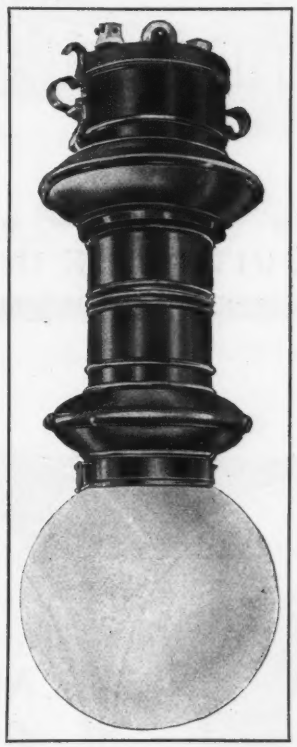
The American Beck
FLAMING ARC LAMP

Designed and Manufactured for the Most Exacting Service

3000 CANDLE POWER

THE BECK gives off no objectionable fumes and may be burned indoors.

THE BECK is mechanically strong, and all parts are heavily nickel-plated.



THE BECK is handsome in appearance, and is the only practical flaming arc lamp.

THE BECK is guaranteed to give the best service under all conditions.

U. S. Patent, July 25, 1905—Other patents pending.

THE BECK BURNS ON ANY FREQUENCY FROM 25 CYCLES TO 133

The **BECK** has no regulating mechanism, and no repair parts are necessary.
The **BECK** saves current, as there is a very small voltage drop in the lamp. The current is fed to the carbons at the arc.
The **BECK** is so designed that no fumes or gas can reach the mechanism—a feature no other flaming arc lamp possesses.

SEND FOR NEW DESCRIPTIVE LITERATURE

NEW YORK BECK LAMP COMPANY

Sole Selling Agents
(Manufactured by Beck Flaming Lamp Company)
30 Greenwich Avenue, NEW YORK

AMERICAN VITRIFIED CONDUIT CO.
FLATIRON BUILDING NEW YORK
MANUFACTURERS OF HIGH GRADE SINGLE AND MULTIPLE VITRIFIED SALT GLAZED CLAY CONDUITS
180,000,000
FEET OF CONDUIT MADE IN ONE FACTORY

We Make These
AND
DOZENS OF OTHERS
IF IT'S MADE OF
NON-CONDUCTING COMPOSITION
WE CAN SUPPLY IT
Bushings, Rings, Collars, Coil Plugs, Battery Covers, Switch Boxes, Switch Keys, Socket Keys, Handles and Mouthpieces, Receiver Shells, and all other Composition Devices.
Special Heat-Resisting Stock for Automobile Parts.
Stock for Storage Batteries Guaranteed Absolutely Acid-Proof.
WRITE FOR PRICES
Dickinson Mfg. Co.
SPRINGFIELD
MASS.

Co=Operation

ALTOGETHER ALL THE TIME
FOR EVERYTHING ELECTRICAL

Proposition No. 1.

Conceive, if you please, of us all as manufacturers, jobbers, contractors, central stations, etc., shouting in confusion and competition the advantages of our electric wares and services to each other and the public.

Result—An expensive commercial hubbub and pandemonium, which largely destroys itself in reaching the public—our final common market.

Proposition No. 2.

Conceive, on the other hand, that we all, recognizing an undeniable community of interest, should shout together these advantages of electric light, electric heat and electric power.

Result—A harmonious and tremendously powerful commercial propaganda, which would be irresistible in popularizing electrical service—in reaching the great public—the man in the street.

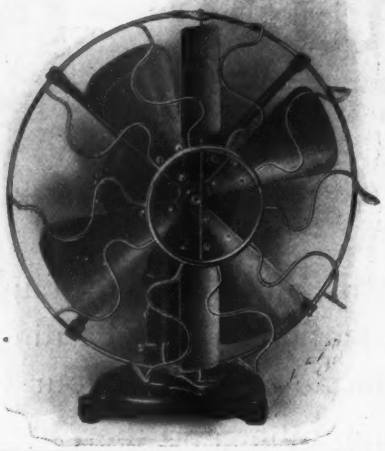
Proposition No. 3.

Individualism, co-partnership, corporation, consolidation, association—the next step will be limited commercial co-operation throughout an entire business. That business will be the electrical business.

Many of us are proud to have contributed time and money to this work—don't you want to join in?
Be-a-co-operator.

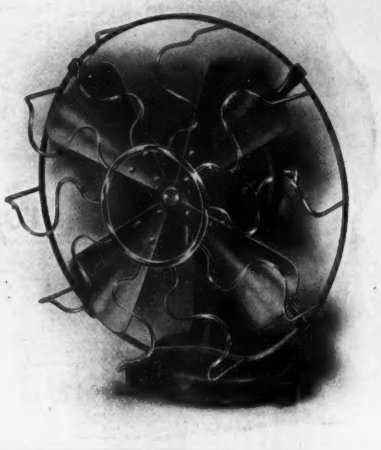
The Co=Operative Electrical Development Association

CLEVELAND, - - - OHIO



Reputation

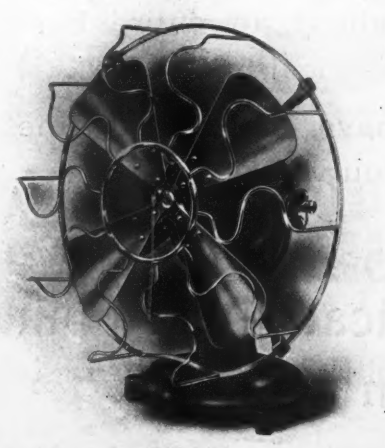
is a created estimation in the mind of another.



Character is the creative force which maintains that reputation.

Colonial Fans

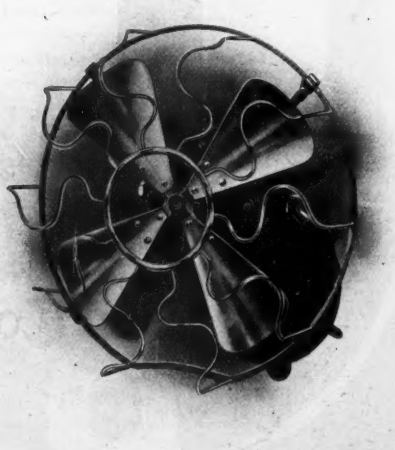
have long been well and favorably known to the most careful and exacting Fan buyers, because the character of the product itself merits the reputation it bears. Our new catalog (1907) describes some features that are worthy of your investigation. Space here does not permit us to say all the good things about them, therefore we ask you to write for full details, or ask any user what he thinks of them.



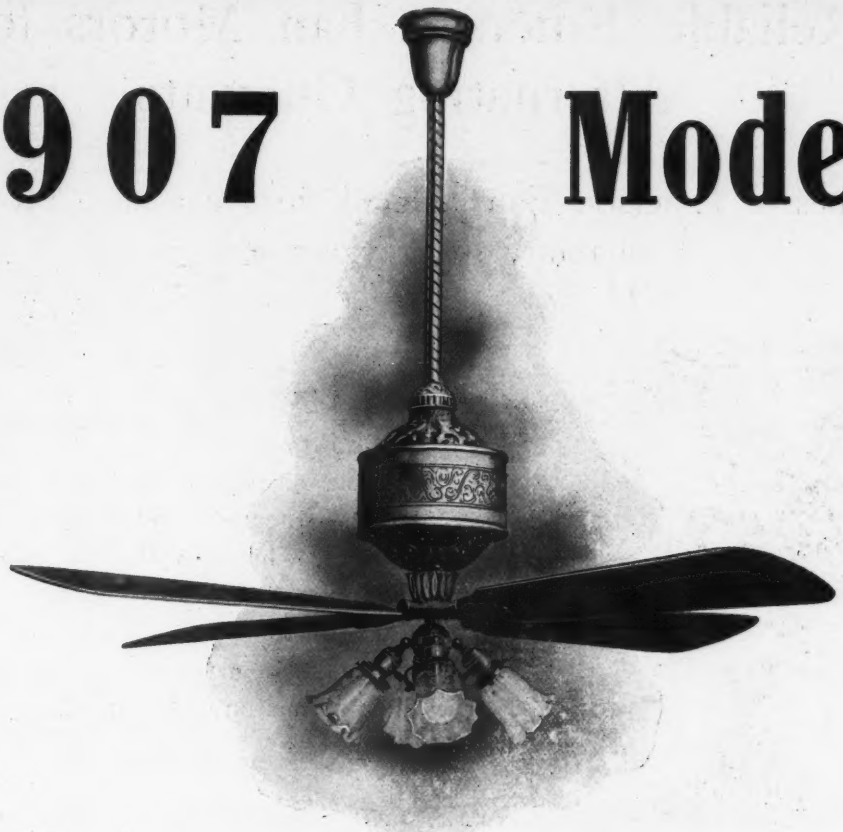
The Colonial Fan & Motor Company

WARREN, OHIO,
U. S. A.

Direct Current Motors, Generators, Exhaust Fans, Rotary Converters, Motor-Generator Sets



1907 Models



HH-2--WITH 4 LIGHT ELECTROLIER ATTACHMENT

PEERLESS FANS

Peerless Fans will stand the most critical comparison with others, the most thorough tests, and show their superiority every time. There's a good reason for this—we spared no labor or expense to procure the best designs that modern skill could produce. We have followed these designs faithfully in our shops—without sacrificing a single detail to reduce manufacturing costs. The result is the best Fan that can be procured—not the cheapest but the least costly in the long run. Send for 1907 Catalogue.

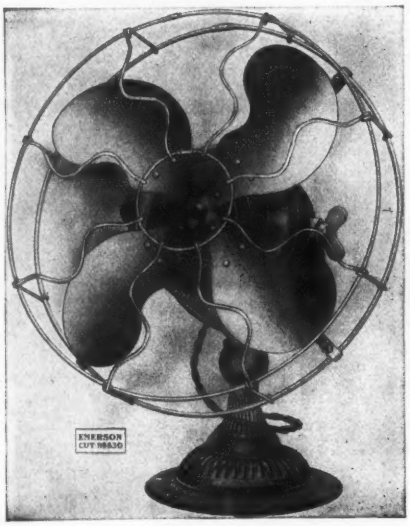
The Peerless Electric Co.

WARREN, OHIO

Peerless D. C. Power Motors and Generators

Reliable Emerson Fan Motors for Alternating Currents

The types of Emerson Fans offered this year have proved their reliability in previous seasons

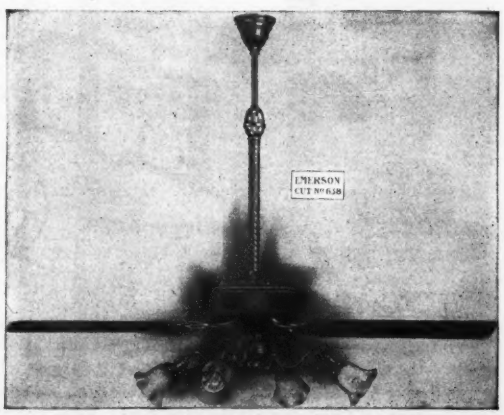


Emerson Desk Fans have the same valuable distinctive features as heretofore. Parker patented blades, giving a well-distributed breeze with least hum. Hardened steel shaft and oil-tight bearing. Efficient form of "power motor" field winding, automatic starting device, giving prompt start on either speed.

All Emerson Desk Fans now have the popular "convertible base" which permits changing to a bracket fan without extra parts.

Emerson Ceiling Fans are the approved three-speed types of 1906 with indicating switch. Adjustable hangers furnished with each fan. Lights easily added to either two-blade or four-blade styles or to column fans, with nominal expense.

Write for complete catalogues giving full information. Prices sent to the trade in convenient booklet form.



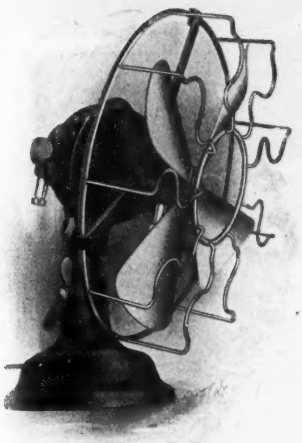
The Emerson Electric Mfg. Co.

Main Office, St. Louis, Mo.

Eastern Office and Warehouse 136 Liberty Street, New York City

SPRAGUE ELECTRIC FANS

FOR 1907



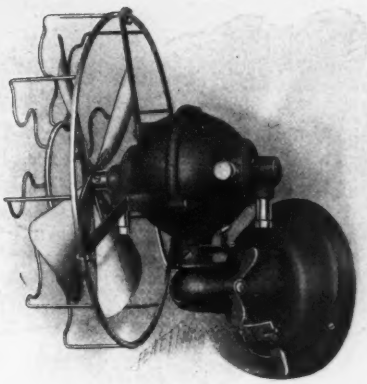
IMPORTANT

ANNOUNCEMENT

TO DEALERS

STOCK PROBLEM SIMPLIFIED

THREE TYPES OF FANS IN ONE



By means of the new universal joint, one fan, without extra parts, can be used as Desk, Swivel and Trunnion Desk or Wall Type. Dealers will find this feature a great advantage. There are other improvements also, which combine to make these famous fans better than ever.

SPRAGUE ELECTRIC COMPANY

General Offices: 527-531 West 34th Street, New York

Branch Offices in Principal Cities

Diehl

LATEST TYPES

CEILING FANS
COLUMN FANS
UNIVERSAL DESK
TRUNNION AND BRACKET FANS
TELEPHONE BOOTH FANS
EXHAUST FANS

No. 46. Ceiling Fan with Electrolier.

1907 FANS

ARE THE RESULT OF 19 YEARS' EXPERIENCE. THEY ARE CONSTANTLY GROWING IN POPULARITY. THE GREAT ANNUAL INCREASE IN SALES PROVES IT. DIEHL FANS APPEAL TO CENTRAL STATION, SUPPLY DEALER AND FAN USER.

We also manufacture a full line of motors and generators for every purpose.

Send for bulletin.

No. 36. Fan — Bracket

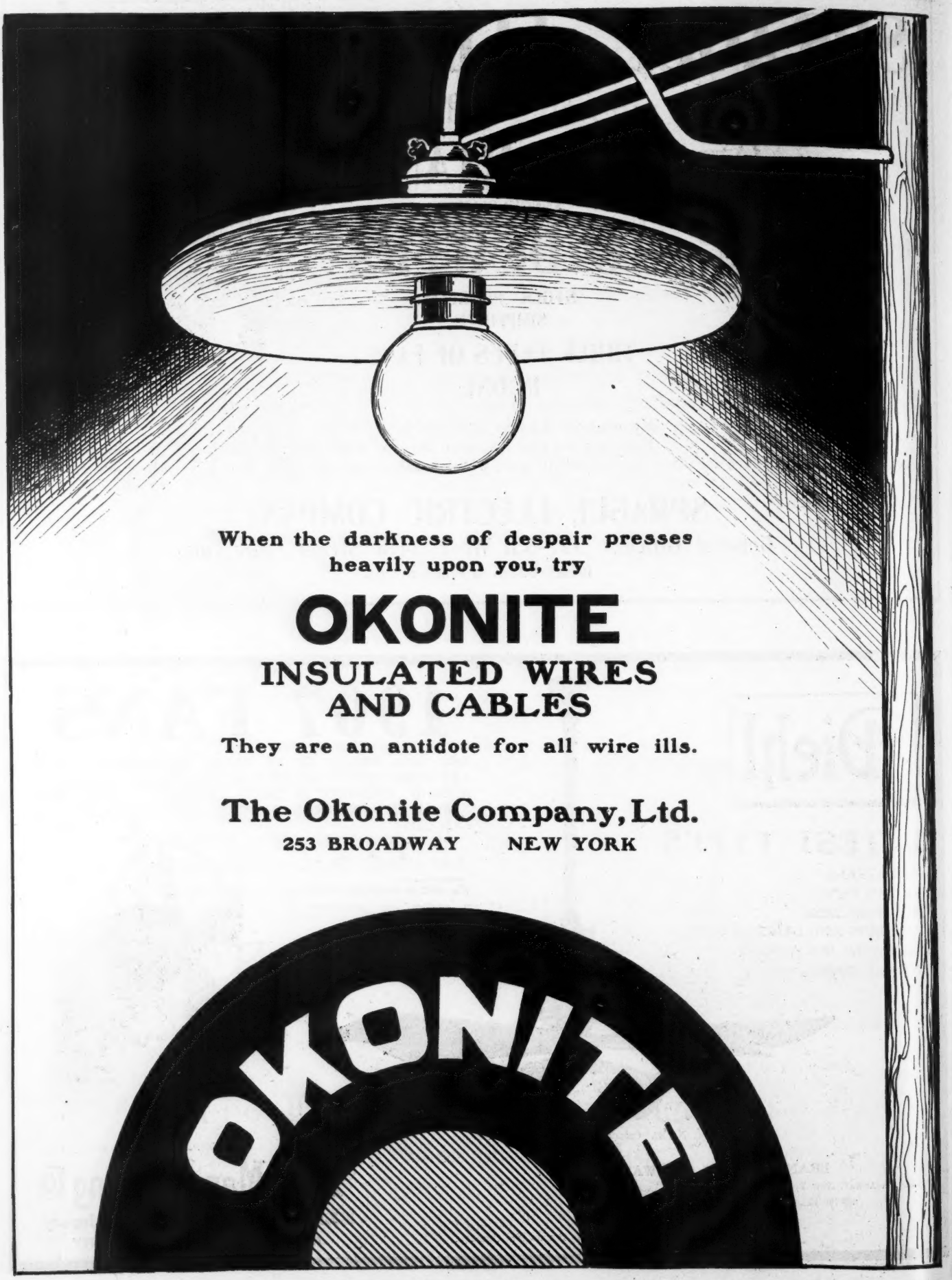
BRANCH OFFICES AND WAREHOUSES

561-563 Broadway, New York.
128-132 Essex Street Boston.
1217 Filbert Street, Philadelphia.
207-211 East Jackson Boulevard, Chicago.

Diehl Manufacturing Co.

ELIZABETHPORT, New Jersey

MAIN OFFICE AND FACTORY



When the darkness of despair presses heavily upon you, try

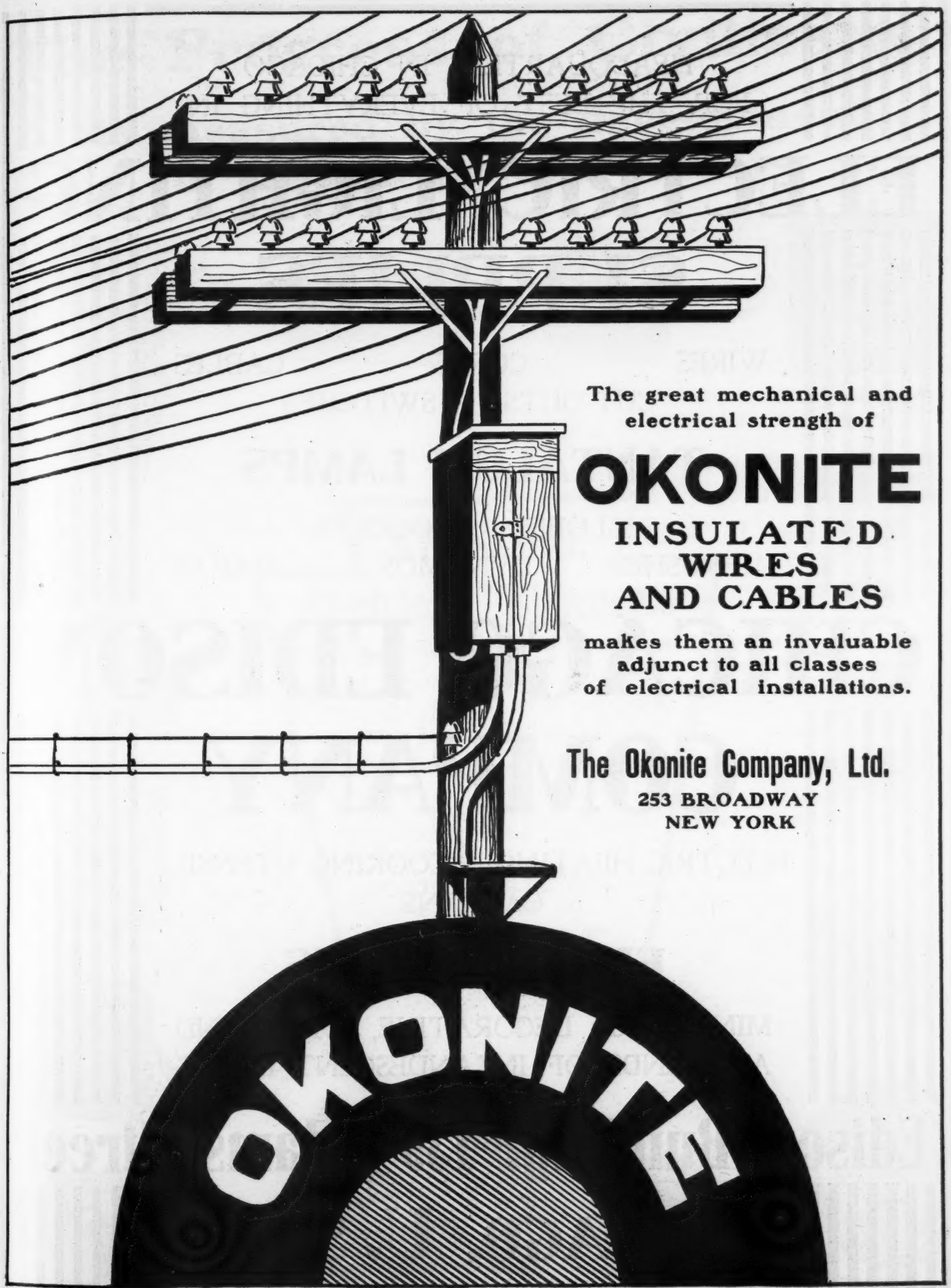
OKONITE

INSULATED WIRES AND CABLES

They are an antidote for all wire ills.

The Okonite Company, Ltd.

253 BROADWAY NEW YORK



The great mechanical and electrical strength of

OKONITE

INSULATED WIRES AND CABLES

makes them an invaluable adjunct to all classes of electrical installations.

The Okonite Company, Ltd.

253 BROADWAY
NEW YORK

HEADQUARTERS IN CHICAGO
FOR THE BEST OF EVERYTHING IN

ELECTRIC LIGHTING SUPPLIES

WIRES CORDS CABLES
CUT-OUTS SWITCHES

TANTALUM LAMPS

GLOBES SOCKETS
BRUSHES DYNAMOS PARTS

CHICAGO EDISON COMPANY

ELECTRIC HEATING AND COOKING UTENSILS
CARBONS

ELECTRIC FANS

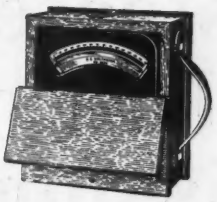
MINIATURE, DECORATIVE, HYLO AND
ALL KINDS OF INCANDESCENT LAMPS

Edison Building, 139 Adams Street

CHICAGO, U. S. A.

The Progress of Civilization

is measured by the development in measuring instruments



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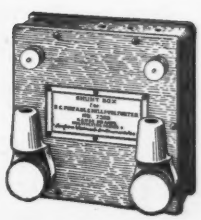

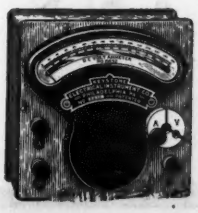
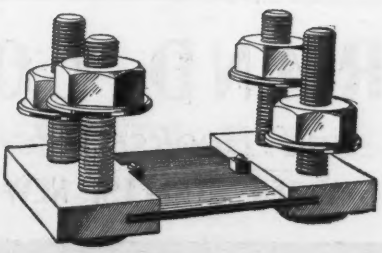

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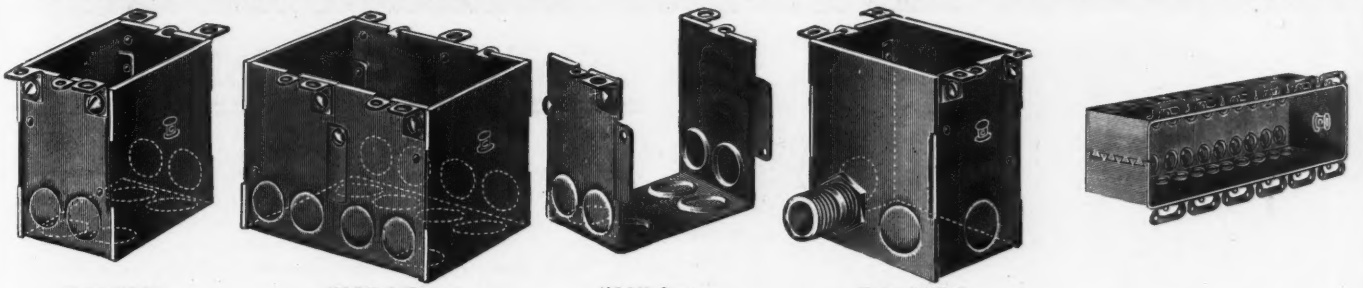

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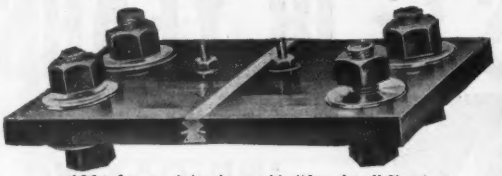

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Short Talk on Electrical Advertising for Buyers of Journal Space

The cost of impressing the people of the electrical industry—or any branch of it—is much smaller if electrical journal space is the means, than through circulars or folders, or direct-by-mail methods.

The effect of journal advertising is sure and may be relied upon as fully demonstrated.
Its value is no longer in doubt.

Now and again one finds a company—yes, and there are several among electrical manufacturers—which prides itself on never advertising and points to its success.

These companies, in almost every instance, have taken the "long road" and their successes have been reached in spite of the non-advertising policy.

And not because of it.

In the olden days the buyer signed agreements for specified spaces, using it, "whether or no" throughout the period.

And for which he sent the publisher "cut and copy."

Never varying it unless the cut should break down.

This is changed.

As for instance, the "Electrical Review" service permits the use of varying sizes of space from week to week—large or small—under a mere price agreement, and the advertiser is assured of always receiving the lowest rates.

And, too, the "Electrical Review" maintains an Advertisers' Art Department, which, without cost to advertisers, illustrates and prepares "copy."

Why the "Electrical Review" for the electrical industries?

First—It is the oldest electrical weekly—age in itself is not a factor, but in the instance of the "Electrical Review" it is a consideration, as each year it has progressed in editorial prestige, circulation and in the dependence placed upon it by the engineering industries.

Second—Its circulation embraces the "Cream" of the electric lighting, street railway, telephone and general electrical interests.

Third—The "Electrical Review" is quoted by the daily, weekly and monthly press more than all other electrical publications combined.

Fourth—Advancements in electrical invention, descriptions of important engineering accomplishments, reports of proceedings of technical societies and conventions, are almost invariably published in the "Electrical Review" from one to seven days in advance of other journals.

Fifth—The "Electrical Review" is published entirely independent of any technical journal combination or syndicate. Its rates for space are as low as is consistent with the service it offers.

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Showing Plug Closed

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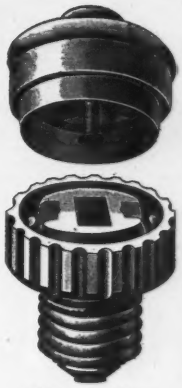
TO ALL USERS OF

ATTACHMENT PLUGS



Showing Plug Separated

Any one using, making or selling a Separable Attachment Plug that can be swivelly operated, is infringing on U. S. Patent granted to Chas. J. Klein, assigned to Ralph A. Schoenberg, Proprietor of the Sarco Company.

Read these Two Broad Claims of our Patent:

2.—An electrical attachment plug comprising two body members separably and swivelly operatively connected, one of said body members, being provided with circuit members, and the other of said body members being provided with electrical connections respectively adapted for electrical contact with said circuit members, and locking means detachably uniting said body members.

6.—An electrical attachment plug, comprising two separably and swivelly operatively connected body members, one of said body members being provided with circuit members, and the other of said body members being provided with electrical connections and with binding screws adapted to hold electrical conductors, said electrical connections being adapted for electrical contact with said circuit members, and locking means whereby said members are detachably united.

We will vigorously prosecute any infringement on our Patent rights and fully protect our customers and users of the Sarco Separable Swivel Attachment Plug.

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THE SARCO COMPANY

906 SIXTH AVENUE, NEW YORK CITY

ELECTRICAL SARCO SPECIALTIES. TRADE MARK

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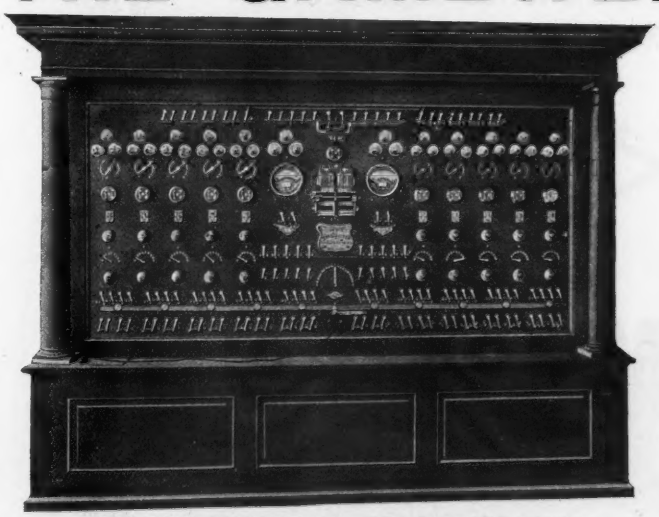

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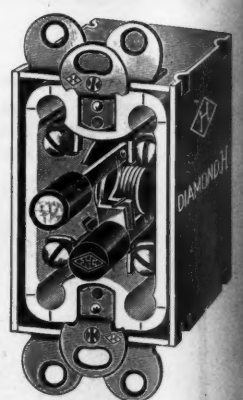

Push Button Switch in Galvanized Wall Case

"DIAMOND H"

Standard Switch without Dial

Switches are of the greatest absolute value because they are the most continuously accurate switches made; the least likely to get out of order, and altogether the most dependable switches on the market.

Standard Switch with Indicating Dial.

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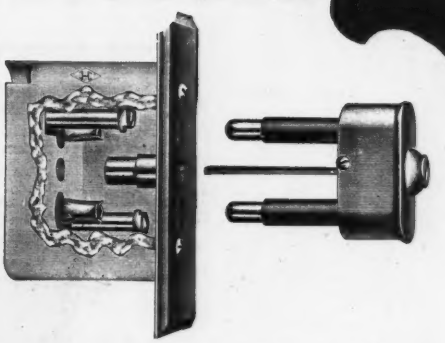
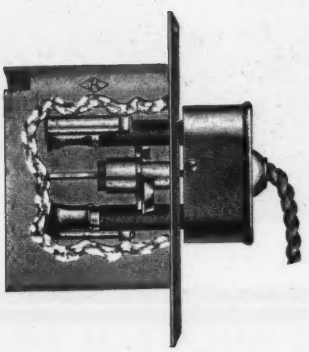


Receptacle with Plug Ready to Insert

should be used in preference to all others. They can be operated by a child without danger, as they cannot ground or short-circuit. The face-plate opens or closes automatically by inserting or withdrawing the plug. No screw-driver or other tools required.



Receptacle with Plug Inserted

Why don't you find out for yourself, as so many others are doing, the good points of "DIAMOND H" Switches and Receptacles? TRY THEM

HART MFG. CO.

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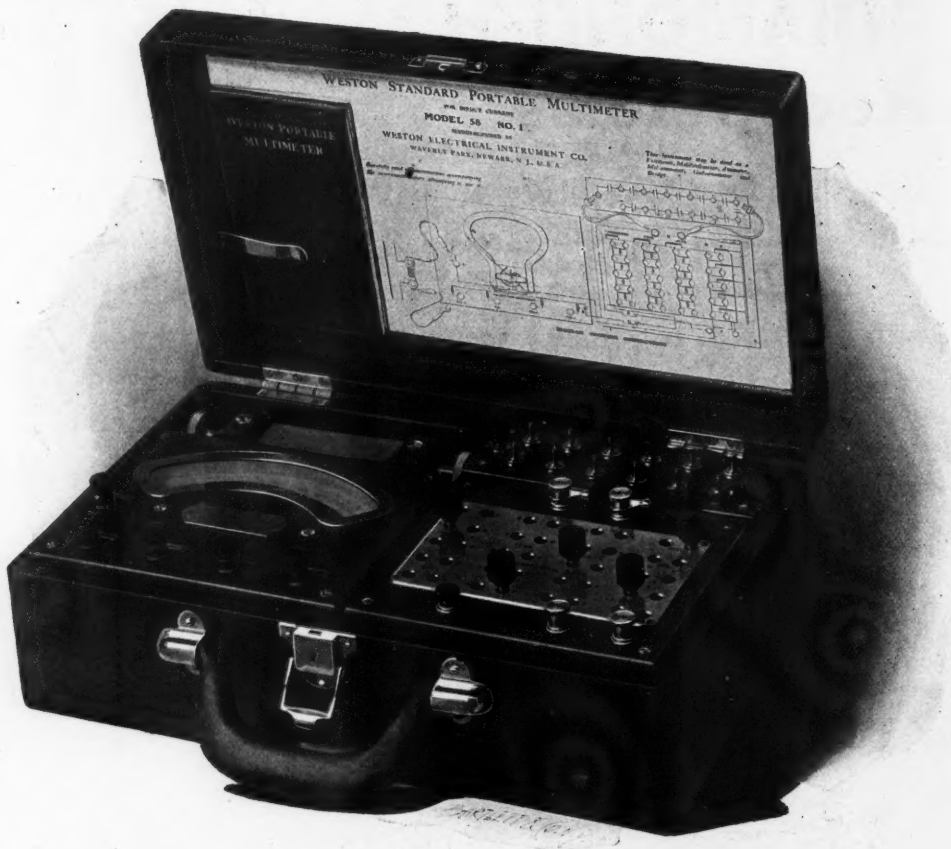
Some New WES

The Weston Multimeter



As its name implies, this is an instrument which possesses a very wide range of usefulness in the measurement of electrical quantities. In fact, in it is found a combination which performs the

WESTON ELECTRICAL

WAVERLY PARK,

STON Instruments

several functions of a milli-volt-meter, voltmeter, mil-ammeter, ammeter, and a Wheatstone bridge and galvanometer and battery for use therewith.

As a milli-voltmeter it has a range of .075 volt for a full scale deflection of 150 divisions, or .0005 volt per division.

As a voltmeter it has 3 ranges:

1st. 3 volts for 150 divisions, or .02 volt per division.
2nd. 150 volts for 150 divisions, or 1 volt per division.
3rd. 750 volts for 150 divisions, or 5 volts per division.

It has a similar range for current work from .015 ampere for a full scale deflection, up to 150 amperes for a full scale deflection.

In addition it has an excellent 3-dial bridge of the Weston pattern, combined with a 12-cell battery.

It is very compact, carefully adjusted and in every way a fine piece of instrument work. It will be found very useful in many lines of electrical work.

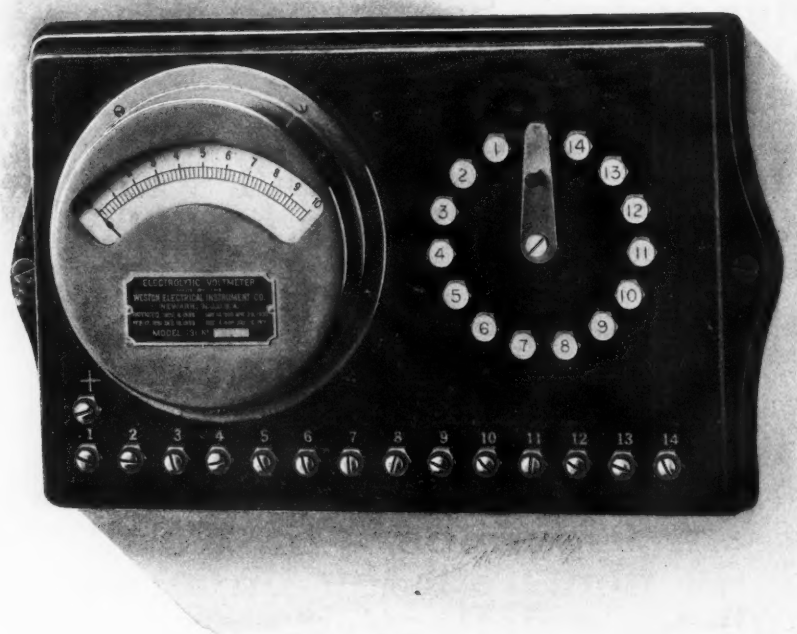
SEND FOR BULLETIN NUMBER SIX

(SEE NEXT PAGE)

L INSTRUMENT COMPANY

NEWARK, N. J., U. S. A.

WESTON
Electrolytic Voltmeter



The accompanying cut illustrates a New Model Weston Voltmeter expressly designed to meet the requirements of electro-platers, electrotypers, and others engaged in the art of electro-metallurgy. It is accurate and thoroughly reliable. It is built in a thoroughly substantial manner; the workmanship is high grade.

It is provided with a 15-point switch so that the difference of potential can be determined at any one of 15 tanks, or all of them successively.

IT IS CHEAP AND GOOD

Special Bulletin describing the instrument and giving prices can be obtained by application.

WESTON ELECTRICAL INSTRUMENT COMPANY

WAVERLY PARK NEWARK, N. J., U. S. A.

General Electric Company

Lightning Arresters

for protection against
all excessive voltages

Photo by W. N. Jennings, Phil.

Every insulation strain by abnormal voltage tends to decrease the useful life of apparatus.

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They are designed to protect against every sort of excessive insulation strain caused by lightning strokes, line surges, static discharges or other disturbances.

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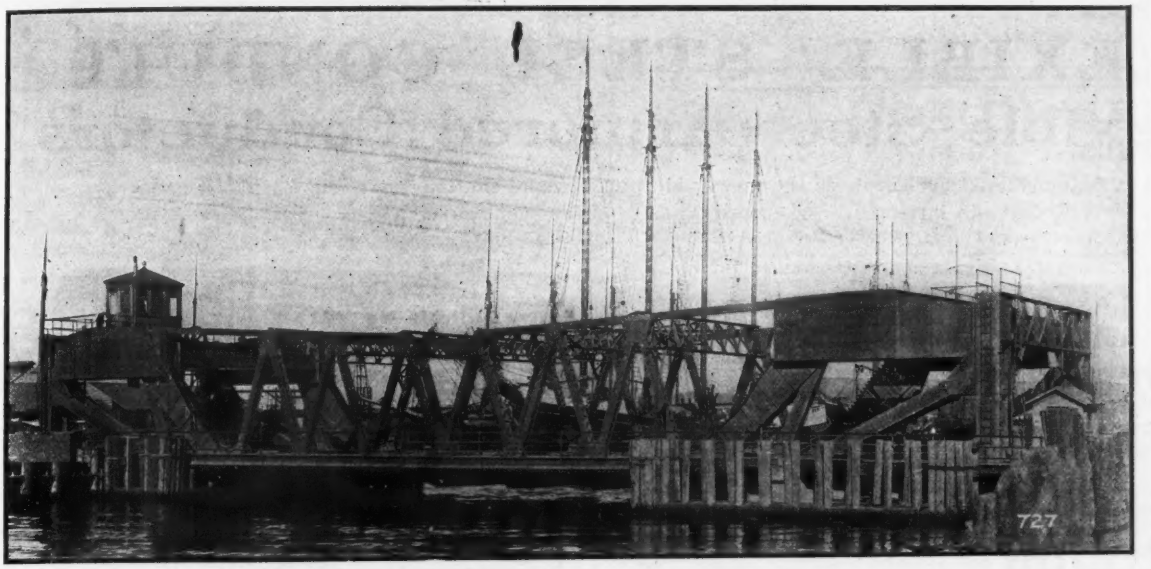

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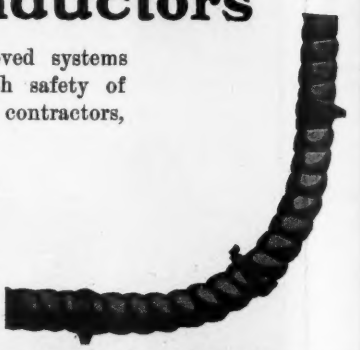

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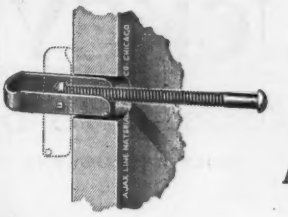

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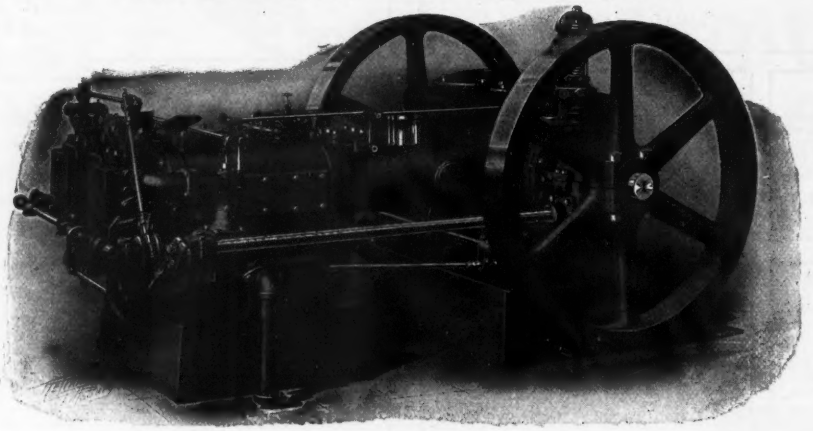

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(Continued on page 91)

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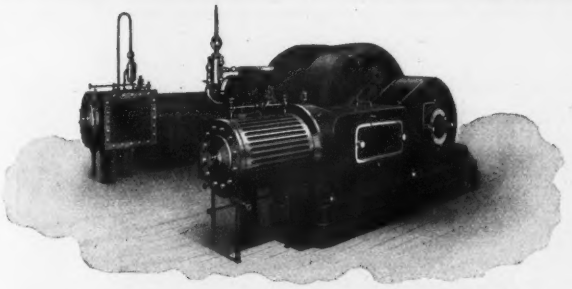

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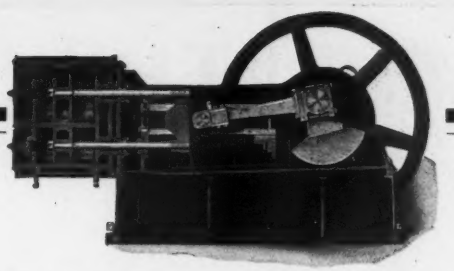

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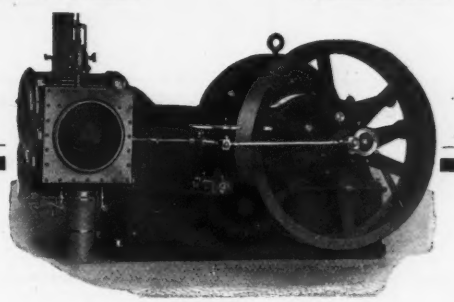

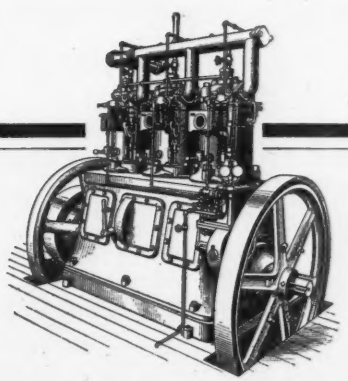

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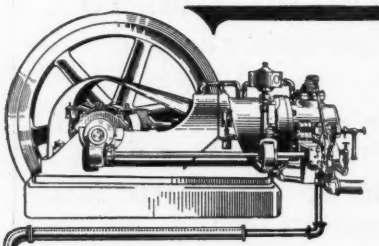

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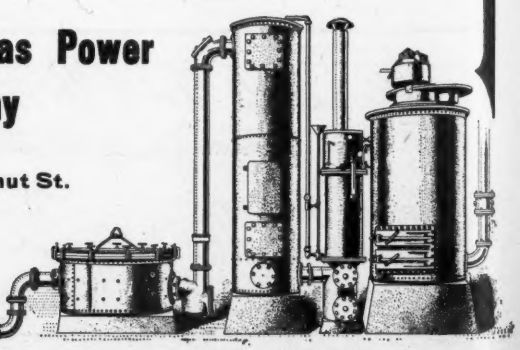

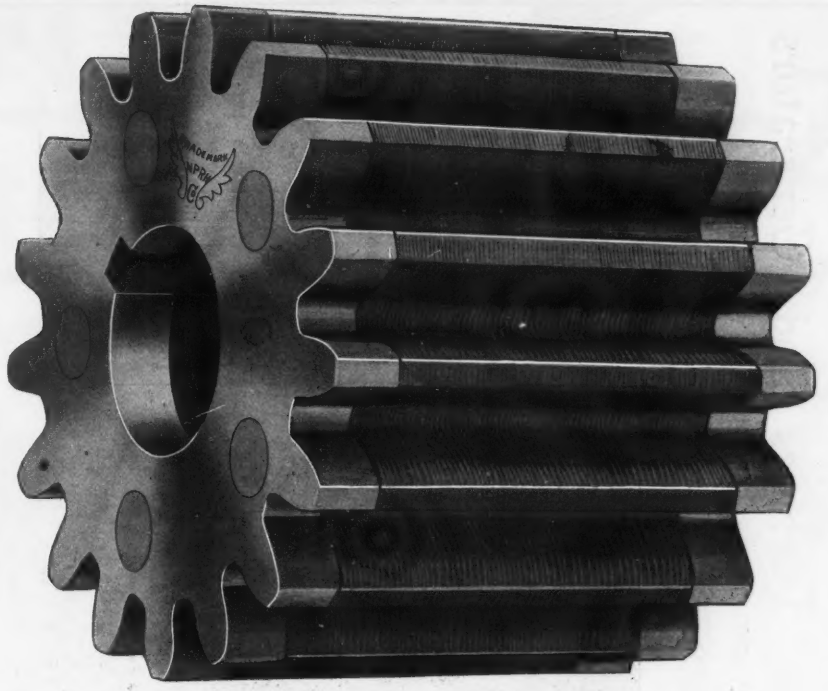

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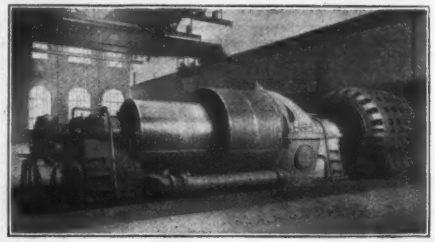

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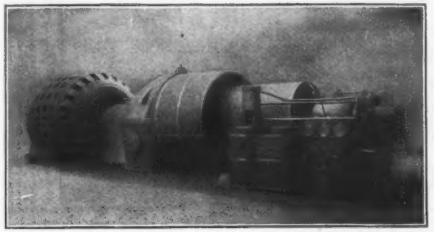

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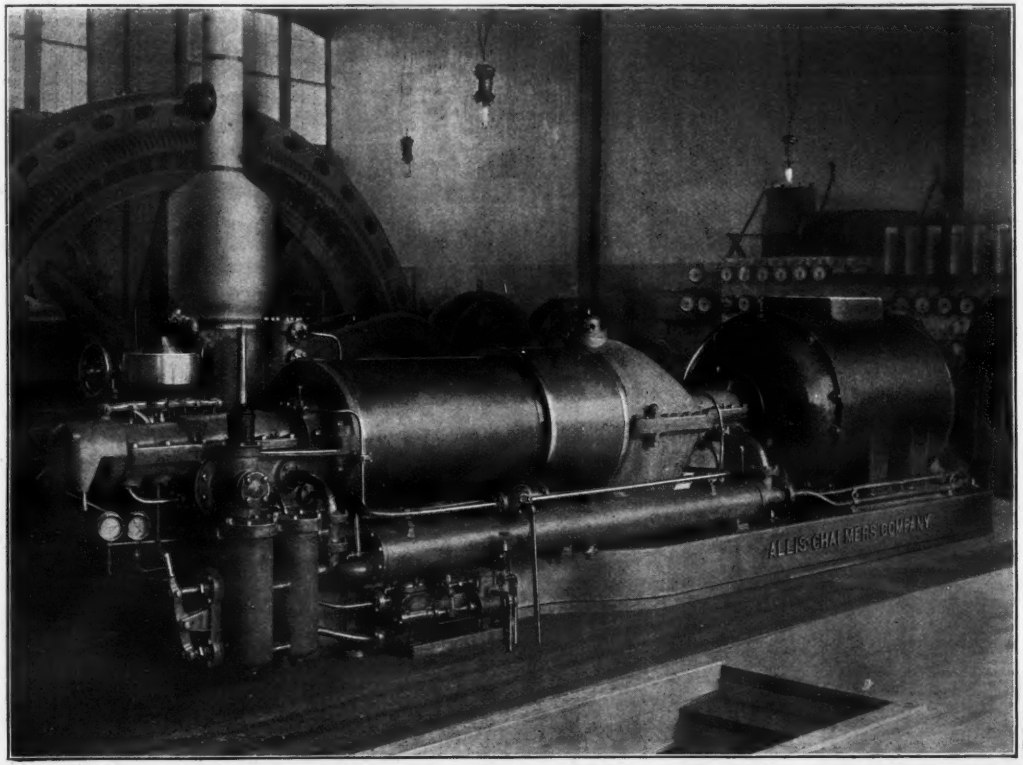

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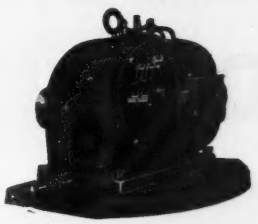

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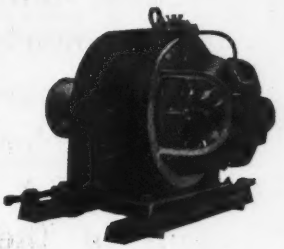

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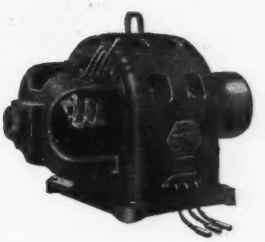

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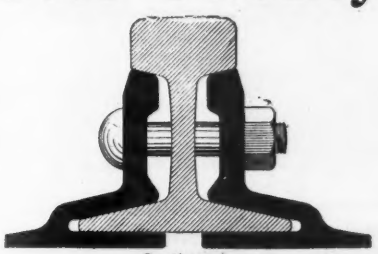

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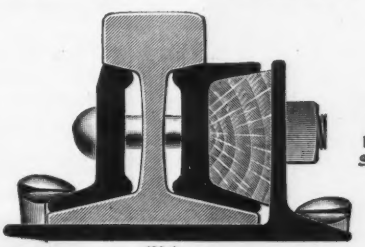

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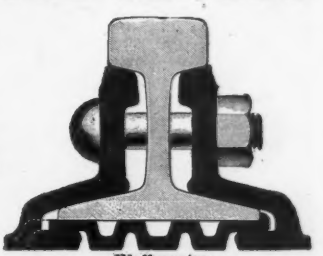

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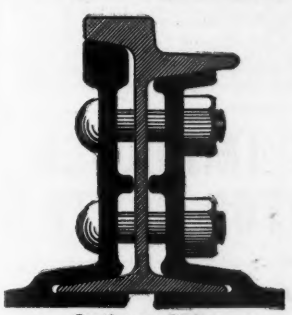

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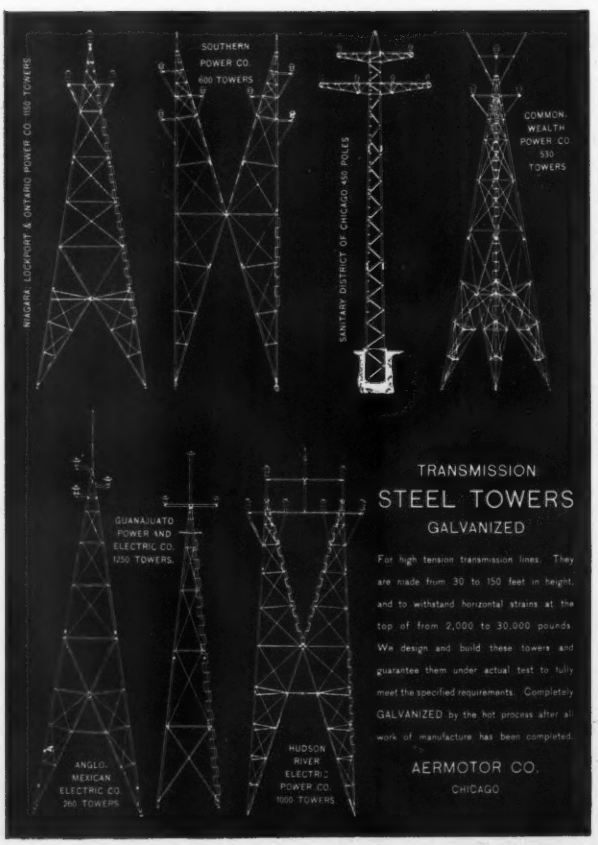
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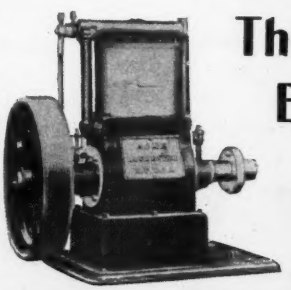

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Is the only device made that has no complicated parts, such as Dash Pots, Rubbing Contacts, etc., to get out of order. A radically new invention based on gravity. It protects your motor from burning out. Motor is started with minimum energy in shortest possible time. Write for further information.

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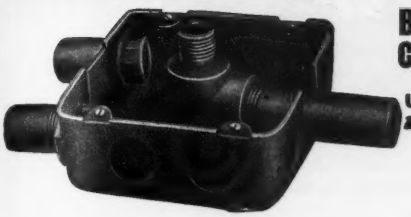
have hermetically sealed outlets, the plugs of which can be removed with one blow of the hammer.



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A trial of them will convince you of their sterling value and money saved when used.

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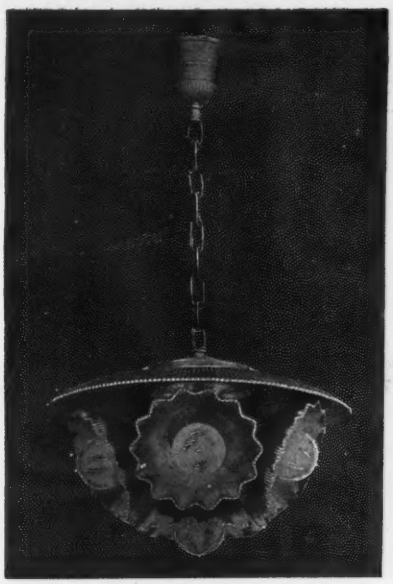

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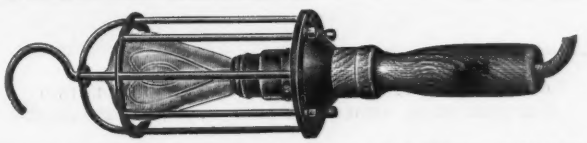

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CRESCENT COMPANY, Valparaiso, Ind.

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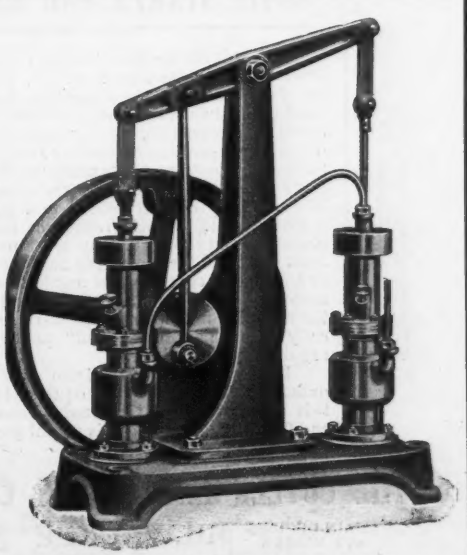
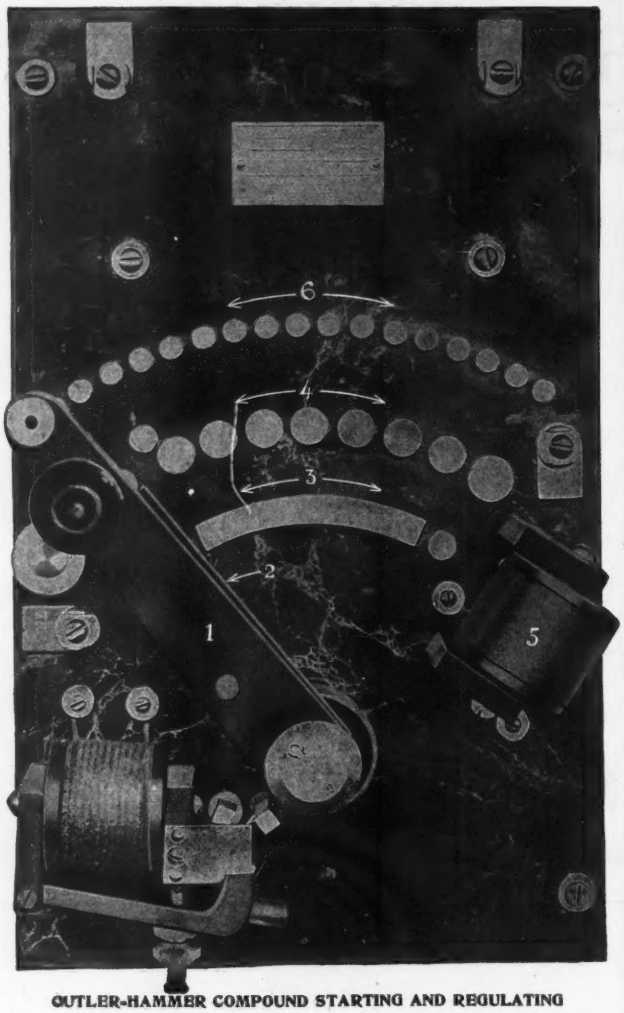


This is the GENUINE "Geryk" Pump, manufactured by the Pulsometer Engineering Company, England.



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ONE RHEOSTAT

BOTH STARTS AND REGULATES

Mounted on the same hub-post with the regulating lever (1) is the starting lever (2), provided with an auxiliary contact on the under side, which, through the medium of the curved sector (3) located just below the armature contacts (4), short-circuits the field resistance during the operation of starting the motor. When all resistance is cut out of the armature circuit the starting lever is held in position by the retaining magnet (5). The auxiliary contact having now passed beyond the curved sector, the field resistance is no longer short-circuited, and the regulating lever may be moved by itself back and forth over the field rheostat buttons (6), or left on any contact, thus regulating the speed of the motor. Failure of voltage, or an overload, de-energizes the retaining magnet and the starting lever automatically flies back to the "off" position, carrying the regulating lever with it.

Injury to the motor from overload or starting under weakened field are equally impossible where this form of rheostat is used. Send for Bulletins 24 and 25, fully describing this useful piece of apparatus.

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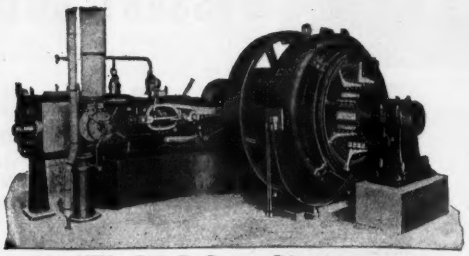

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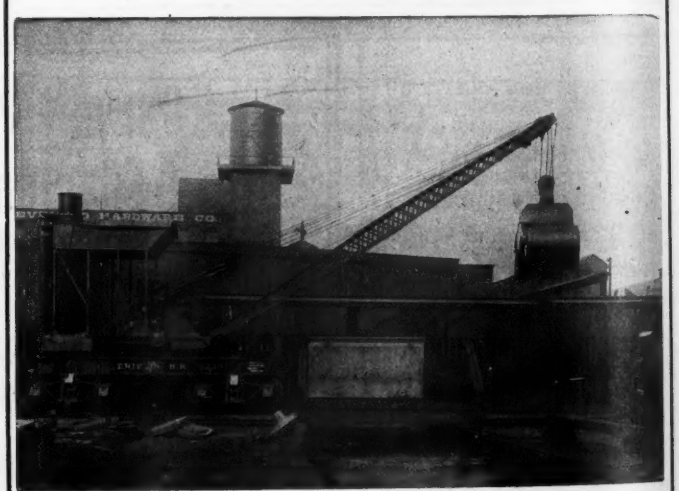
are found to be exceedingly economical Tools about power and lighting stations



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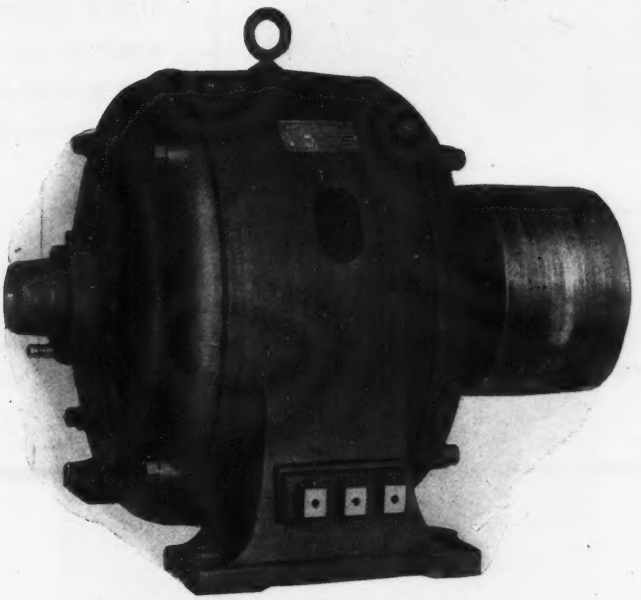

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Modern design and construction in "Old-Fashioned" weights. There are "reasons why" some of the largest Polyphase installations in the country are Wagner Motors.

We are maintaining the high quality of our Single-phase construction in our Polyphase design.

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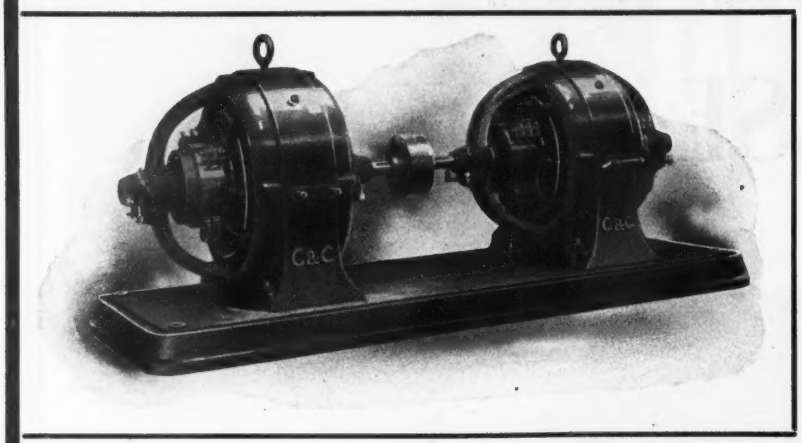
An Electric Welding Outfit That Welds Without Waste of Current



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"CAMP DUCT" lasts longer than any other conduit made.
"CAMP DUCT" is made to resist the acids, alkalies, gases and other chemical elements in the earth. They are non-corrosive, and in every respect absolutely permanent in character and composition.
They are made to last, and they DO last.

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"Wood" Systems

Perfect Insulation

An essential condition which all manufacturers are aiming at and which all consumers positively demand. There is a vast amount of satisfaction in knowing that such a condition does really exist in a transformer. It is one of the distinctive points of Superiority of our Type A Transformer.

We use a system of insulation in Type A Transformers that must result in perfect insulation—there is no alternative. That process is one of many safeguards in their manufacture. It is not only a result of Superior design but practical tests verify our claims.

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Fort Wayne Type A Transformers are shell type. They are made shell type to afford the best regulation. This is made possible by reason of shorter winding which lessens the loss. The result of our design is a combination of all the essential qualities necessary in the best transformer. Type A Transformers are popular with their owners because there is no doubt about their performance.

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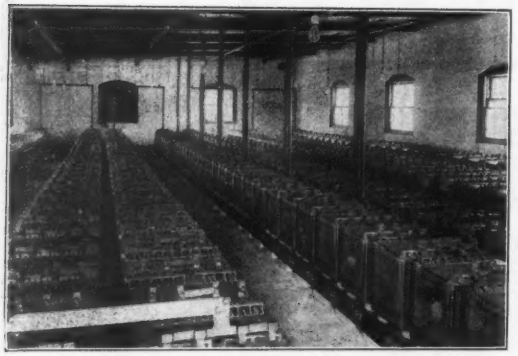
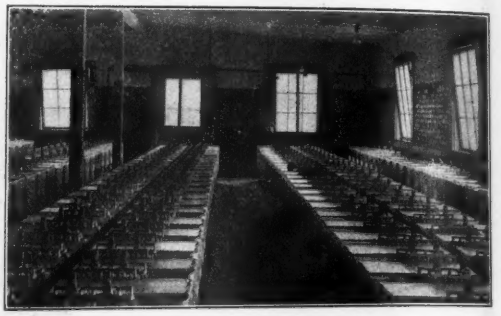
548

The Final Test of a Storage Battery



is the complete record of its actual month after month performance. No other test, no academic or technical arguments, carry the same conviction to the prospective purchaser, as the *demonstrated* money-saving power and money-earning power of batteries *in regular service.*

It is with full realization of this truth that we invite the most critical investigation of every detail of the Gould Battery, and the records of the many plants we have installed, and offer every facility to the buyer to make such investigations complete.



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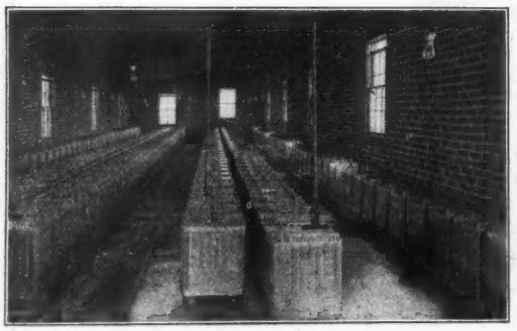

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An ideal flexible conduit in every respect. It possesses the double advantage of saving time on the installation and of making a better job than any substitute. It has been successfully used on buildings of all kinds—from modest dwellings to costly public buildings.

Try it and be convinced of its qualities.

"ELECTRODUCT"

is the original enameled steel conduit and is still the best one of its kind made. THE ENAMEL, our own product, is guaranteed not to chip or crack even when the conduit is bent to curves of short radius.

We can convince the most skeptical of its worth.

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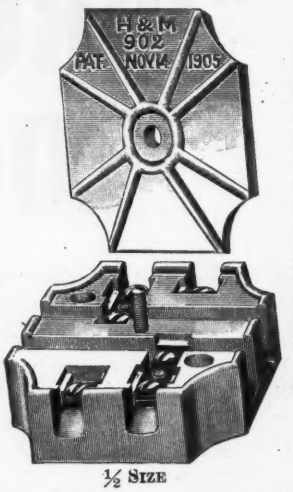
WHEN A PLUMBER OR STEAM-FITTER HAS OCCASION TO RUN A BRANCH LINE FROM THE MAIN HE GENERALLY USES A FITTING KNOWN AS A TEE—YOU PROBABLY ARE "WISE" TO THIS. WELL, H & M BRANCH BLOCKS ARE "ELECTRICIANS' TEES." THEY ARE THE FITTINGS WE WANT YOU TO GET "WISE" ON.



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Doesn't it appeal to you as a pretty good method of making branches? Why not have suitable fittings for your wiremen to work with? All you need is an assortment of the six different styles. We make a block for every form of branch. The cut herewith illustrates our No. 902 two-wire main to double two-wire branch. They do away with *all* of the objectionable features of the old method, and make a safer, cheaper, and more up-to-date method of making branches.

YOUR JOBBER OUGHT TO KNOW
If he doesn't, we do—get "wise" at once

THE ELM CITY ENGINEERING COMPANY
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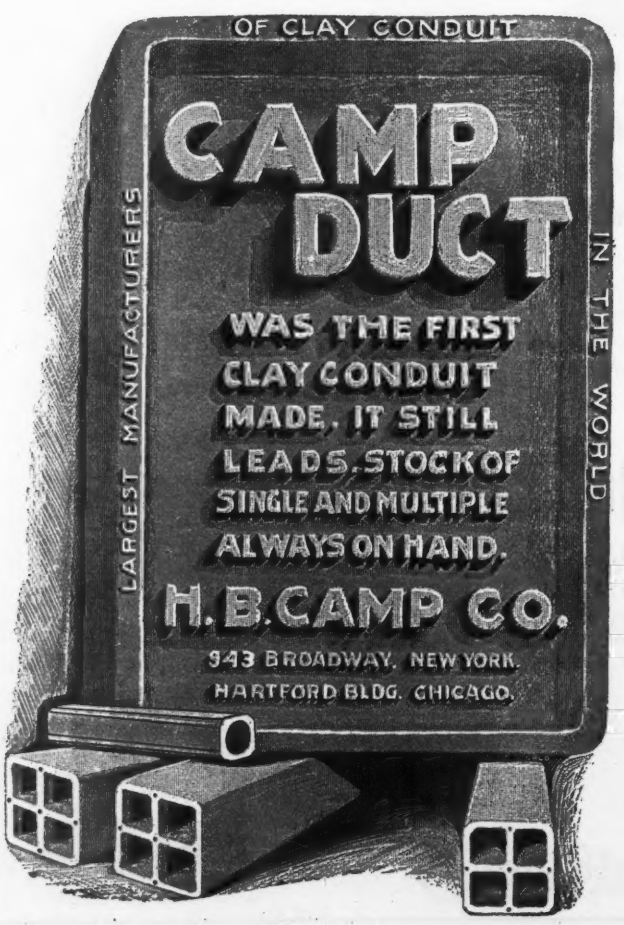
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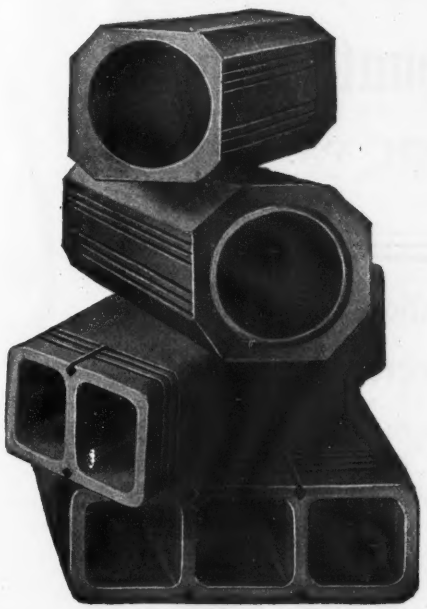

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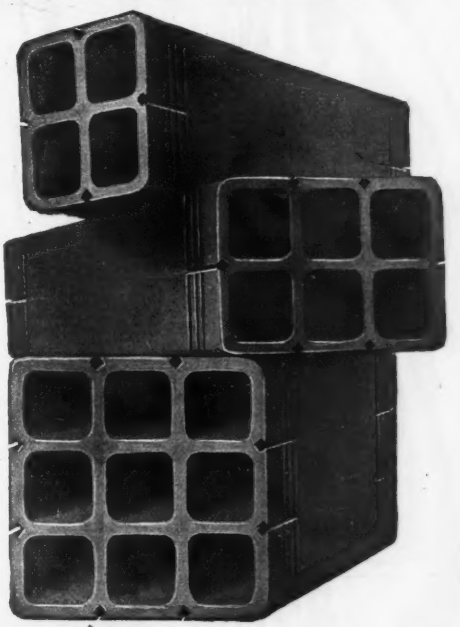
3¼ inch Round Bore
3½ " " "
4 " " "
3½ " Square "
3¼ " Round "
(Socket Joint)

MULTIPLE DUCT

2, 3, 4, 6 and 9 Duct
3¼ inch Square Bore
3½ " " "

MULTIPLE DUCT

2, 3, 4 or 6 Duct
3¼ inch Round Bore



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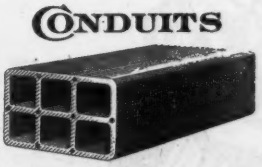

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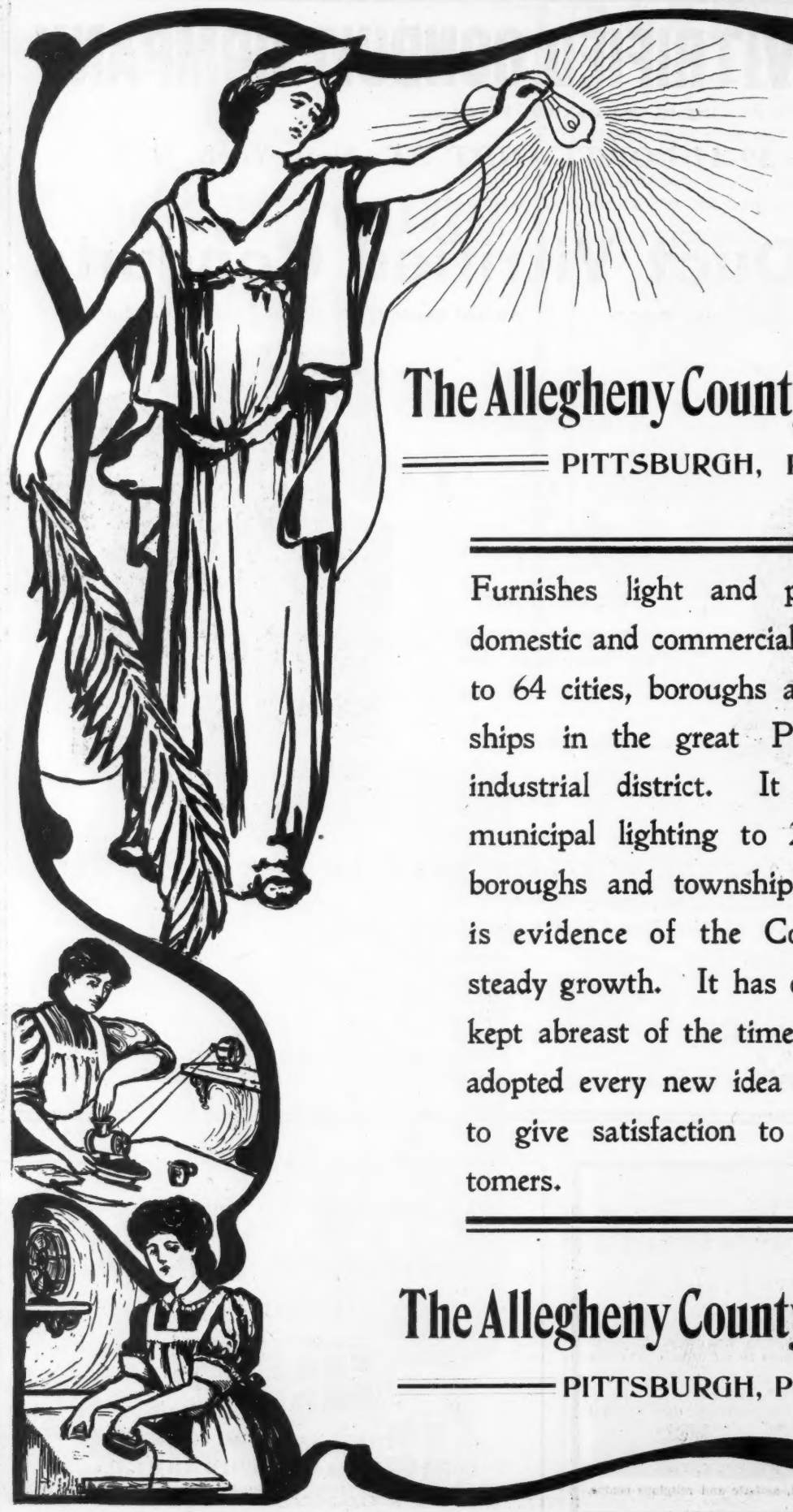

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Furnishes light and power for domestic and commercial purposes to 64 cities, boroughs and townships in the great Pittsburgh industrial district. It furnishes municipal lighting to 28 cities, boroughs and townships. This is evidence of the Company's steady growth. It has constantly kept abreast of the times and has adopted every new idea calculated to give satisfaction to its customers.

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The Edison Electric Illuminating Company of Brooklyn is not as old as the ELECTRICAL REVIEW.

It cannot boast a quarter of a century.

It began business September 2d, 1889, and is therefore not quite eighteen years of age.

Nevertheless, some things have happened in those eighteen years.

And the Brooklyn Company feels pride in the fact that it has had some modest share in the historic development of an industry which has added materially to the value of human life—an industry which, in its remarkable inception and rapid growth, is we believe, without a parallel.

Brooklyn's share in the development is interestingly indicated in the following table, which shows the load in 16-candle-power equivalents connected to the Company's system on the first of January in each succeeding year from the Company's inception down to 1907.

	Connected 16 C. P. Equivalents
Jan. 1, 1890	6,600
Jan. 1, 1891	25,170
Jan. 1, 1892	42,283
Jan. 1, 1893	76,192
Jan. 1, 1894	104,021
Jan. 1, 1895	128,189
Jan. 1, 1896	154,523
Jan. 1, 1897	175,973
Jan. 1, 1898	218,831
Jan. 1, 1899	296,632
Jan. 1, 1900	376,248
Jan. 1, 1901	408,163
Jan. 1, 1902	465,041
Jan. 1, 1903	537,352
Jan. 1, 1904	637,083
Jan. 1, 1905	808,189
Jan. 1, 1906	932,715
Jan. 1, 1907	1,167,595

Unless all signs fail, the electric lighting and power business—which is half an industry and half an art—is just beginning to enter into its own and can look forward in the immediate future to a wonderful increase in usefulness and prosperity. The ground has been cleared, the obstructions removed, the preliminary work accomplished. Now comes the harvest. What will *not* the *next* twenty-five years bring forth?

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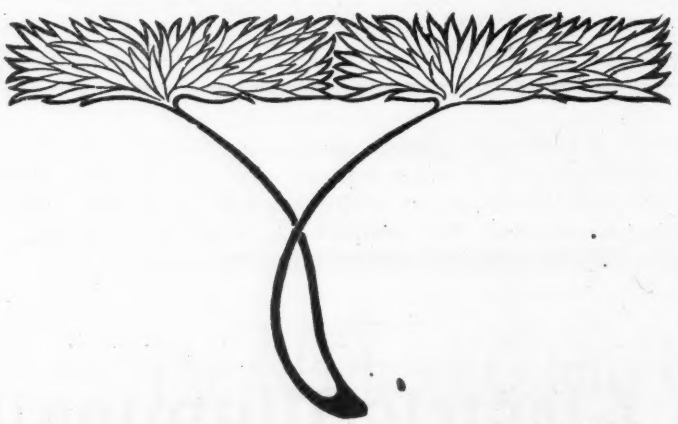

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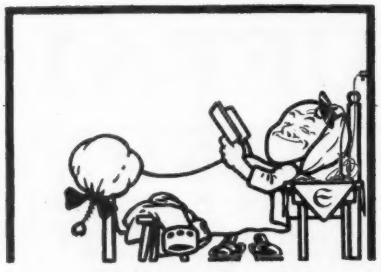

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2. The finest technical schools in the world, furnishing unequalled "raw material" for expert service.

3. A general atmosphere of successful manufacturing conditions that by reason of Boston's advantages have in the past and will in the future continue to exist.

4. Liberal banking accommodations because conditions around Boston have created successful manufactures, especially in the electric line. This begets a confidence in financial circles that breeds liberal accommodations to manufacturers.

5. An electric light and power service developed as nowhere else in this country.

6. An absolutely fair and equitable method of charging, because the cost of manufacture is fairly distributed according to the various requirements of the users—and the charge is proportionately distributed.

7. A population of 5,000,000 people close at hand.

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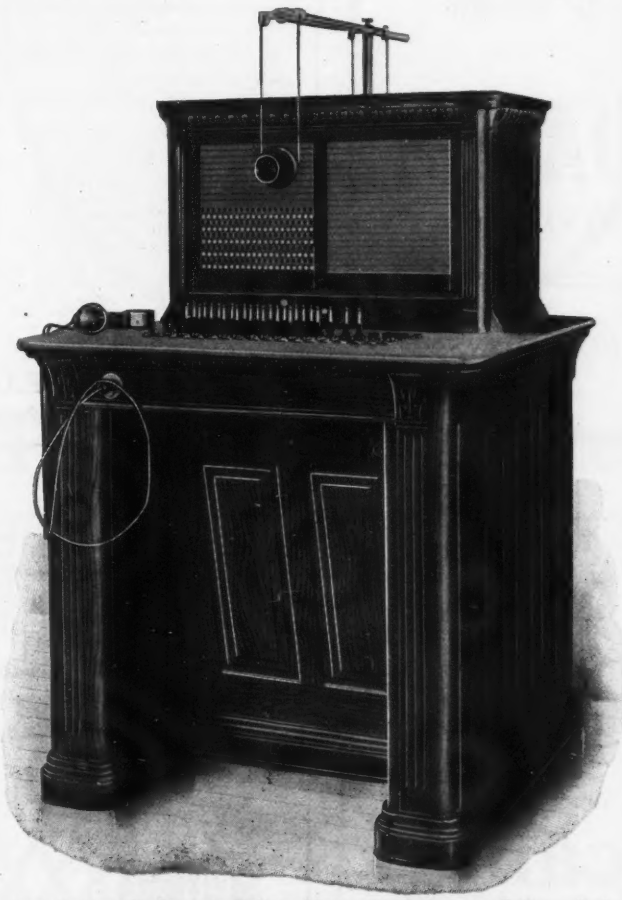

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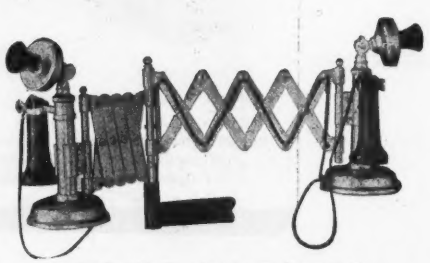

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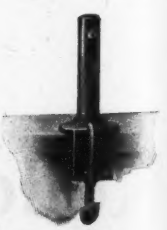

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1902	167,792	42,414
1903	210,981	43,189
1904	255,993	45,012
1905	321,890	65,897
1906	**389,000**	**67,110**

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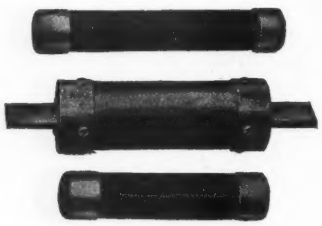

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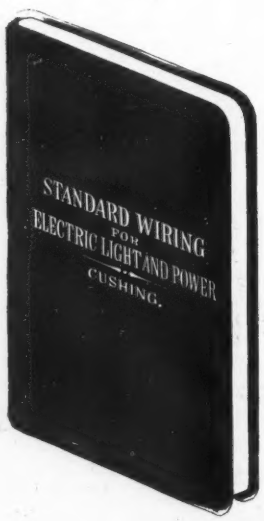

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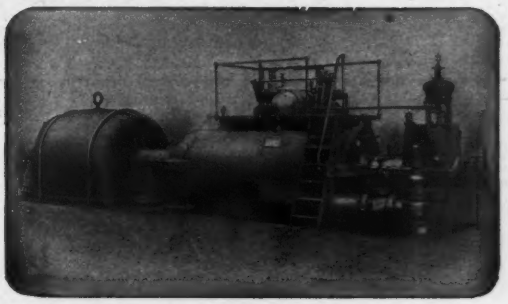

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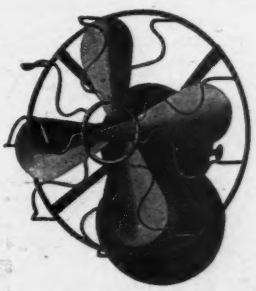

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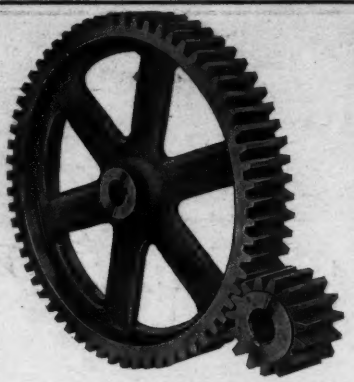

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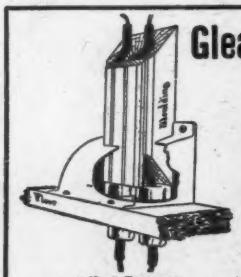

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RUBBER INSULATED
WIRES AND CABLES
Aerial Submarine
Flameproof
Lead Covered Steel Taped
Prompt Attention to Special Requirements
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TELEPHONE, TELEGRAPH AND FIRE ALARM CABLES
All Wires Are Tested at Factory
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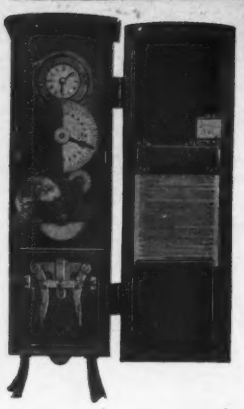

The Square Deal on Flat Rate Service.

One of the important uses of the **ANDERSON ELECTRIC TIME SWITCH** is for Flat Rate Service.

This device will act as the impartial servant of both lighting company and customer.

This suggests a good way to avoid unprofitable argument and to preserve peace and amity between the company and the public.

A reliable device is a necessity for such service. The **ANDERSON ELECTRIC TIME SWITCH** covers this requirement perfectly.

We shall be glad to send a descriptive circular on application.

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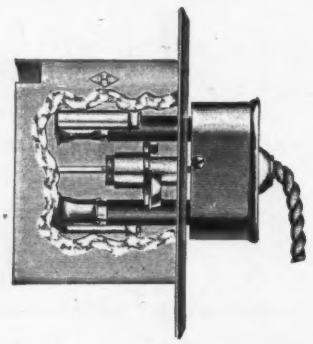
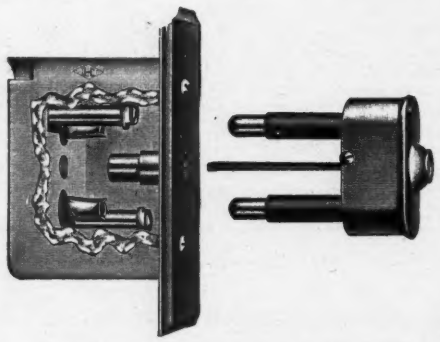
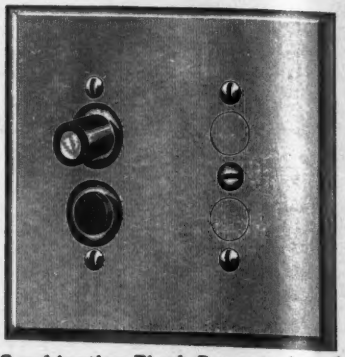


Receptacle with Plug Inserted



Receptacle with Plug Ready to Insert



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It is illustrated with a complete set of new engravings. It describes and illustrates each different type and style of instrument made by us. It tells the story of how our instruments are made, describing the details which you should know and in which every engineer, contractor and user should be interested, if he wants the best. There will be found a complete set of diagrams for mounting switchboard instruments and something of use, value and interest on every page.

We propose in these columns to call your attention once a month to some detail of particular interest such as shunts, springs, pivots, jewels and other details which place our instruments in a class by themselves. The other issues will be devoted to the description of particular types for particular conditions. We figure it will take a year to cover the ground.

Read the advertisements and have the catalog at hand to follow up the references.

It is yours for the asking.

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¶ We originated the snap lock.
¶ Now note the latest feature.
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¶ Better get full particulars.

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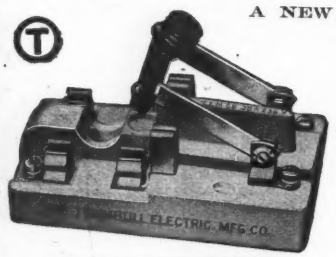

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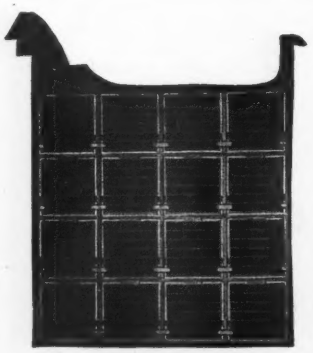

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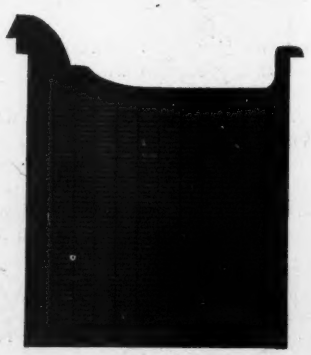

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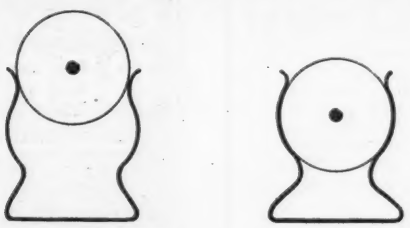
Fuse Talks—No. 7



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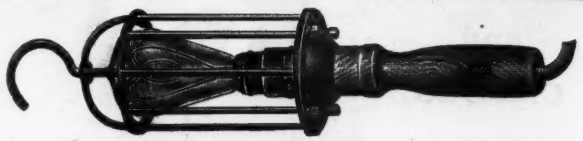

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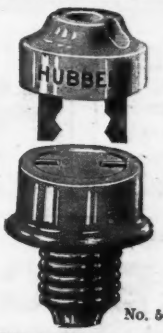

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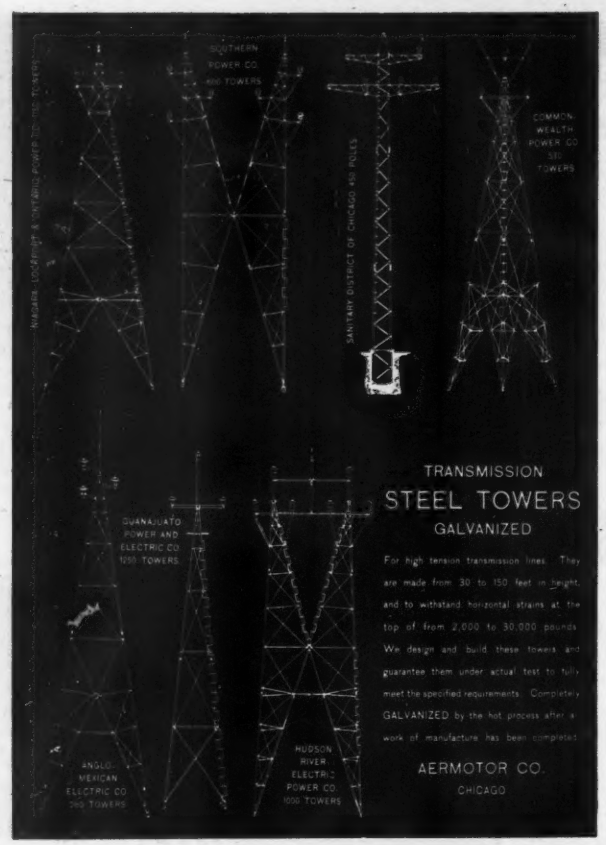
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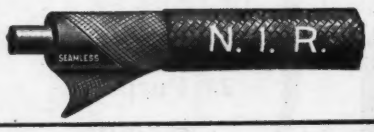

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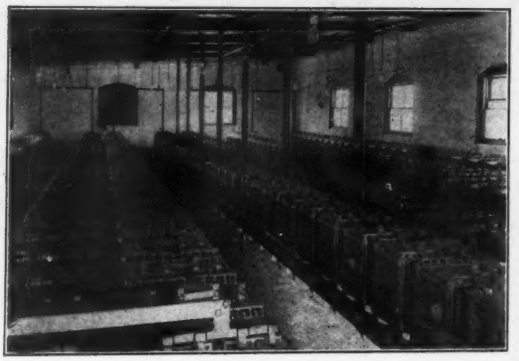

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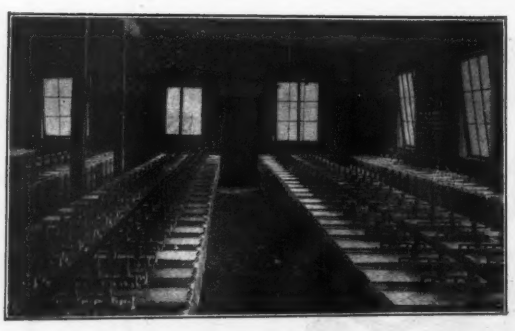

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31. THAT IT PAYS TO
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33. ELECTRIC SIGNS
34. CALL TO SEE US
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36. TO SEE YOU TO
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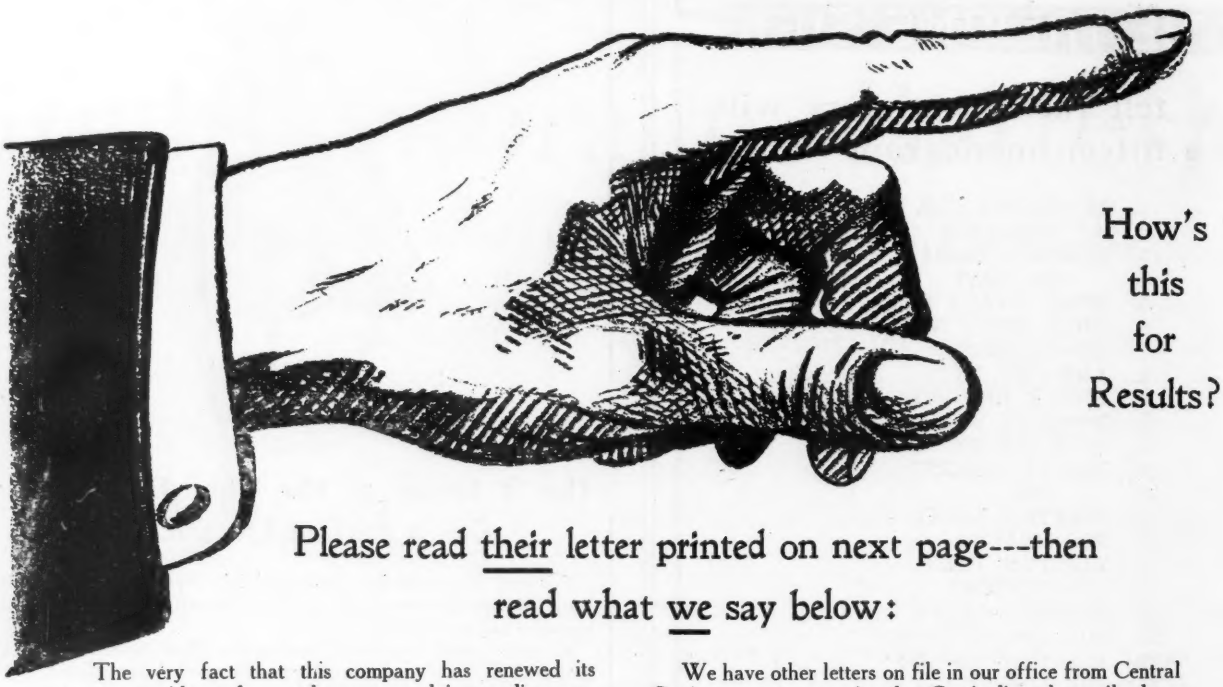
(OLDEST FLUX MAKERS)

1325 Columbia Avenue, Chicago, Ill.
97 Warren St., New York, N. Y.
1236 E. Bay Street, Alameda, Cal.
709-T Victoria Building, St. Louis, Mo.

Proofs that prove Curtis Advertising Service

Kansas City Electric Light Co. Reports:

653 inquiries received out of a total list of 1,000 names.
243 old houses wired from the 653 inquiries.
82 wired through advertising alone without aid of solicitors.



How's this for Results?

Please read their letter printed on next page---then read what we say below:

The very fact that this company has renewed its contract with us for another year and is spending considerably more money in direct-by-mail advertising than last year, must demonstrate to the most conservative Central Station man that Curtis direct-by-mail advertising is practical, economical and resultful.

If 653 inquiries can be gotten through this method from a list of 1,000 people who live in old houses not wired; if 653 people can be gotten interested enough inside of ten months to discuss having their houses wired, there must be something mighty persuasive, original and strong in Curtis direct-by-mail advertising.

And to prove that these inquirers were not curiosity seekers, the books of the Kansas City Electric Light Co. show that 243 of the 653 people that inquired *had their houses wired, spending all the way from* $50.00 *to* $400.00 each, and are now customers of this company, using electric light and electrical appliances.

The records of Mr. Bogie, Director of the Contract Department of this company, also show that 82 people out of this list were influenced to have their houses wired without even consulting the company, and that the solicitor's work in these cases was unnecessary.

This only goes to prove again that advertising matter mailed to these people on the Curtis direct-by-mail advertising plan produced good results.

We have other letters on file in our office from Central Station managers proving that Curtis direct-by-mail advertising is profitable advertising.

Do not judge our methods by those you may now be using. Give us an opportunity to demonstrate to you the same way as we have to the Kansas City Electric Light Co. that our plans are productive of the very best results.

Don't put us in the same class with those who charge for hot air and advice, and are depending only on the first year's appropriation.

If you are in doubt as to our standing, write the most prominent electrical manufacturers in this country. Ask them how long we have been in business and about our methods. You will find that our business has been built up, *not by depending upon the first year's appropriation,* but by *gathering around us a list of good substantial customers, consisting of manufacturers in electrical and other lines, as well as Central Stations, devoting our time and efforts to giving them the most efficient and productive advertising service at the lowest possible price, year after year.*

We repeat again, we charge nothing for advice, nor do we ask a retainer's fee. We are not advertising lawyers or theorists, but we do supply ammunition in the way of advertising matter that brings in the contracts.

Write us to-day.

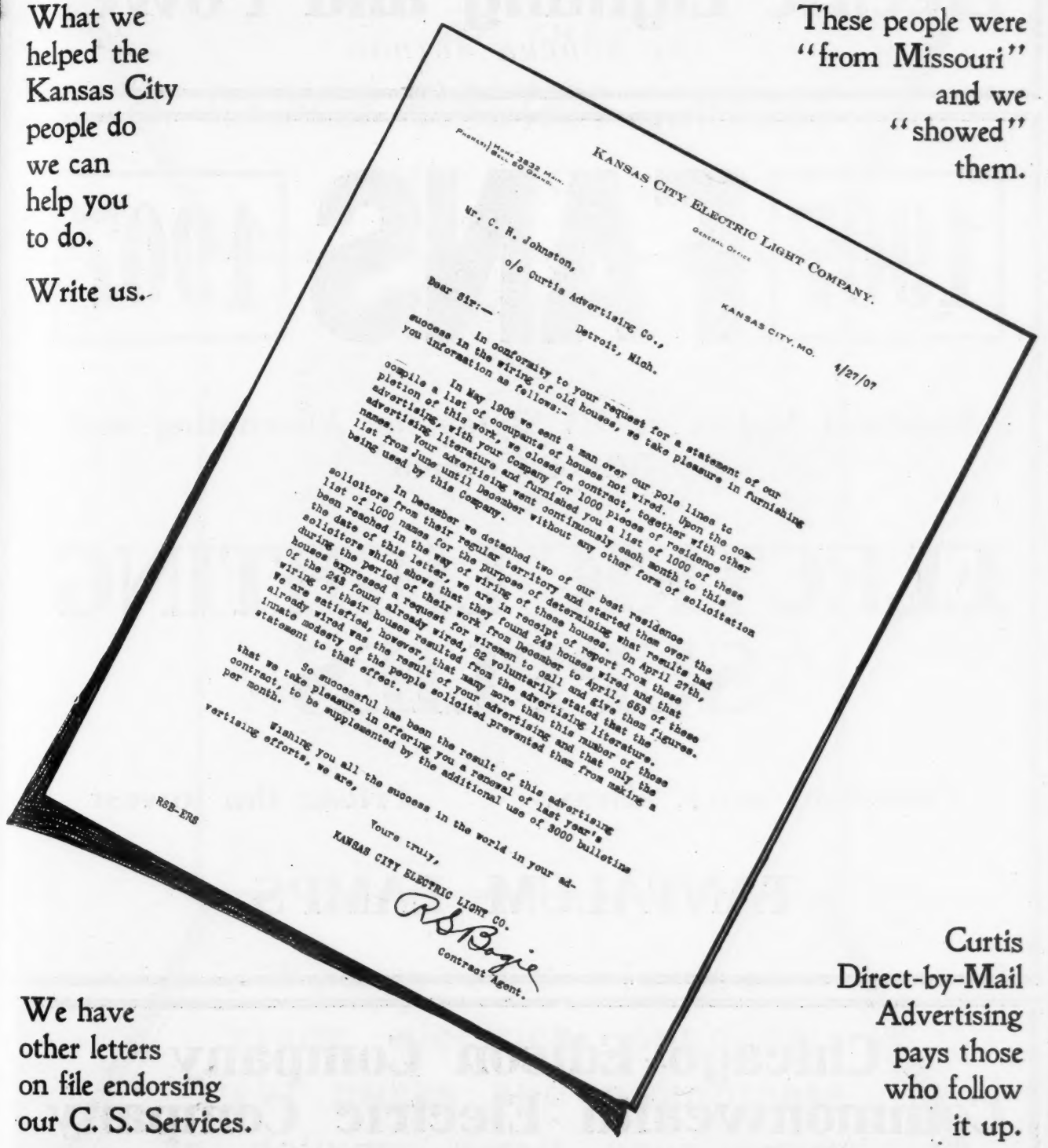
Curtis Advertising Co. Office and Plant Detroit, Mich.

gets the Business for Central Stations

What we helped the Kansas City people do we can help you to do.

Write us.

These people were "from Missouri" and we "showed" them.



KANSAS CITY ELECTRIC LIGHT COMPANY.

GENERAL OFFICE

Phones: Main 2832 Main, Main 60 Grand.

KANSAS CITY, MO. 4/27/07

Mr. C. H. Johnston,
c/o Curtis Advertising Co.,
Detroit, Mich.

Dear Sir:—

In conformity to your request for a statement of our success in the wiring of old houses, we take pleasure in furnishing you information as follows:—

In May 1906 we sent a man over our pole lines to compile a list of occupants of houses not wired. Upon the completion of this work, we closed a contract, together with other advertising, with your Company for 1000 pieces of residence literature and furnished you a list of 1000 of these names. Your advertising went continuously each month to this list from June until December without any other form of solicitation being used by this Company.

In December we detached two of our best residence solicitors from their regular territory and started them over the list of 1000 names for the purpose of determining what results had been reached in the way of wiring of these houses. On April 27th, the date of this letter, we are in receipt of report from these solicitors which shows that they found 243 houses wired and that during the period of their work from December to April, 663 of those houses expressed a request for wireman to call and give them figures. Of the 243 found already wired, 62 voluntarily stated that the already wired was the result of your advertising and that only the wiring of their houses resulted from the advertising literature. We are satisfied, however, that many more than this number of those innate modesty of the people solicited prevented them from making a statement to that effect.

So successful has been the result of this advertising that we take pleasure in offering you a renewal of last year's contract, to be supplemented by the additional use of 3000 bulletins per month.

Wishing you all the success in the world in your advertising efforts, we are,

Youre truly,
KANSAS CITY ELECTRIC LIGHT CO.
R S Bogie
Contract Agent.

RSB-ENS

We have other letters on file endorsing our C. S. Services.

Curtis Direct-by-Mail Advertising pays those who follow it up.

CO-OPERATING WITH THE

Co-operative Electrical Development Association

Central Station Service
Electric Lighting and Power

THE MODERN METHOD

1907 FANS 1907

Standard Makes in All Styles for Alternating and Direct Current

ELECTRIC LIGHTING SUPPLIES

Complete stock always **Prices the lowest**

TANTALUM LAMPS

Chicago Edison Company
Commonwealth Electric Company

General Offices: 139 Adams Street
CHICAGO, U. S. A.

THE HOME

OF THE

ILLINOIS ELECTRIC COMPANY

CHICAGO, ILL.

Where the highest grade electrical supplies, right prices and promptness in delivery await your orders.

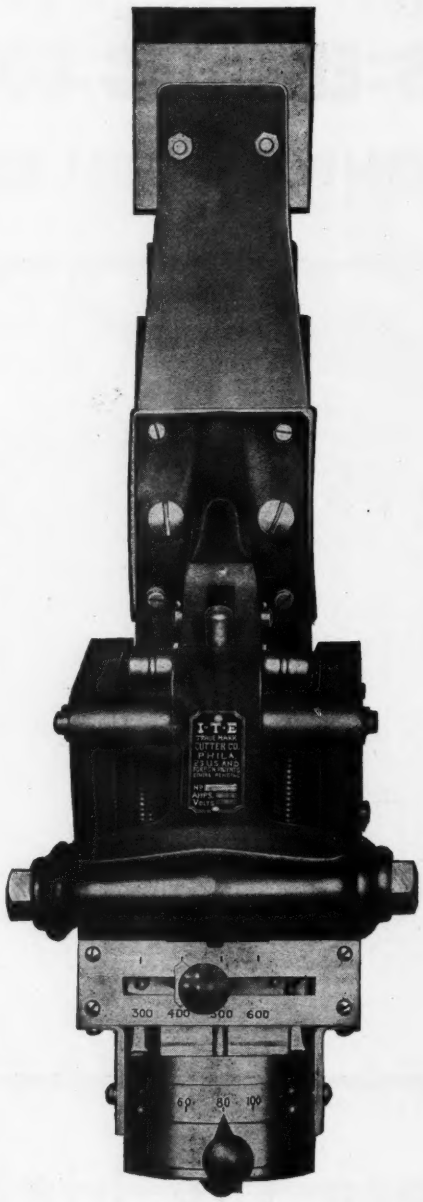
SEND FOR CATALOGUE SHOWING COMPLETE LINE

¶ A Circuit-Breaker is better than a fuse. A fuse does the trick sometimes. An I-T-E CIRCUIT-BREAKER always does. The fuse knows only one trick. An I-T-E CIRCUIT-BREAKER knows a dozen.

¶ The fuse is cheap--it ought to be. An I-T-E CIRCUIT-BREAKER is not as expensive as it ought to be, considering the work it does. The cheapest certain protection is afforded by an I-T-E CIRCUIT-BREAKER. There are several other breakers on the market more expensive, but they cost less to buy. They are more expensive than the I-T-E because they won't last, or won't work, or both.

¶ The only objection to an I-T-E CIRCUIT-BREAKER comes from the maker. They last too long; they don't wear out; they protect electrical and other machinery, and they protect themselves. We cannot afford to build a cheaper breaker, and you cannot afford to buy one.

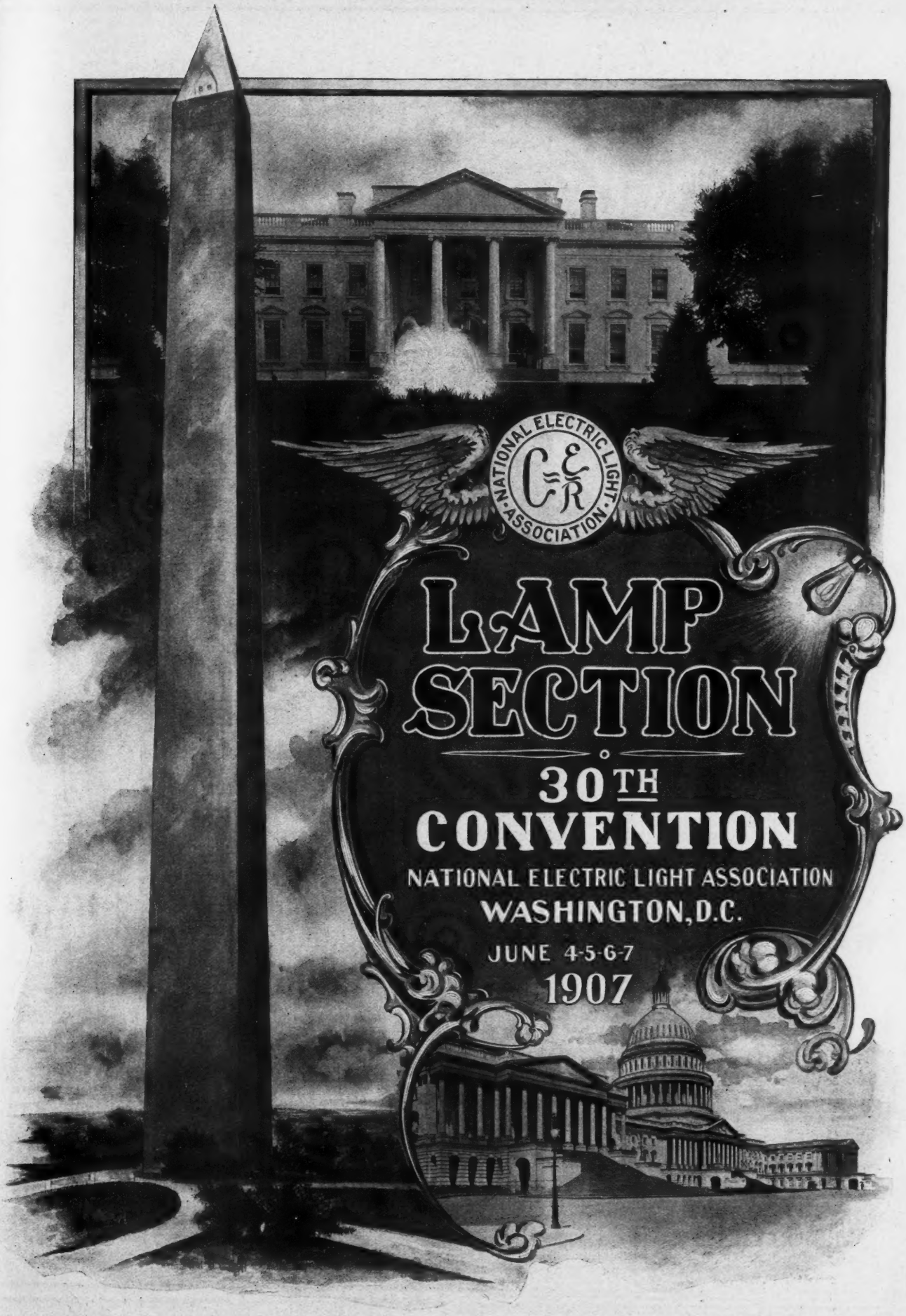
¶ Get the proper I-T-E CIRCUIT-BREAKER in the right place and your troubles are at an end. The right circuit-breaker is an I-T-E CIRCUIT-BREAKER, and you can't get an I-T-E by simply wanting it; you must ask for it, and see that you get it; otherwise you will get a breaker which will cost you almost as much and be much less efficient.



The latest improvement in the I-T-E CIRCUIT-BREAKERS is the Time Limit feature.

See cut. It is a "feature of intelligence" so contrived as to prevent the breaker opening except when the overload has become dangerous. Specify DAL-ITE (Time Limit.)

The Cutter Co., Philadelphia


NATIONAL ELECTRIC LIGHT ASSOCIATION
LAMP SECTION
30TH CONVENTION
NATIONAL ELECTRIC LIGHT ASSOCIATION
WASHINGTON, D.C.
JUNE 4-5-6-7
1907

WE ARE NOW PREPARED TO FURNISH 50-CANDLE-POWER TANTALUM LAMPS CONSUMING ONLY 86 WATTS.

THINK OF IT!

50-C.P.—86 Watts—1.7 W.P.C.

We would recommend these lamps being used with a Style "3C" Pagoda Shade and Form "O" Shade-holder.

We are selling large quantities of the standard 22-candle-power TANTALUM lamps and they are giving universal satisfaction.

Prompt shipments can be made from stock.

The high standard of our carbon filament lamps is still being maintained, and we can make our usual prompt shipments from stock.

Sunbeam Incandescent Lamp Co.

NEW YORK — CHICAGO

DISTRIBUTING AGENTS

WESTERN ELECTRIC COMPANY

NEW YORK PHILADELPHIA PITTSBURG ATLANTA CHICAGO
ST. LOUIS KANSAS CITY DENVER SEATTLE
SAN FRANCISCO (California Electrical Works) ST. PAUL (American Electric Co.) CINCINNATI (Standard Electric Co.) LOS ANGELES (California Electric Co.)

BUCKEYE STANDARD LAMPS

Are of the HIGHEST QUALITY

BUCKEYE STANDARD have been the standard for the past seventeen years.

Our TRADE MARK, the "BUCK'S HEAD," is a guarantee of high-grade Lamps

The most careful and exacting buyers of Incandescent Lamps all over the country are using "Buckeye" Lamps. This ought to convince you that they are worth investigating. "Buckeye" Lamps are cheap, considering their long, useful life, high efficiency and highest maintenance of candle-power during their entire life. Our stock is large and we are in a position to make prompt shipments on all regular types of "Buckeye" standard carbon filament lamps. We make Incandescent Lamps of every known type.

THE BUCKEYE ELECTRIC CO.

Main Office and Works, CLEVELAND, OHIO

NEW YORK OFFICE, 114 LIBERTY STREET
ARTHUR ORGAN, AGENT

CHICAGO, 23 E. LAKE STREET
J. H. COOKE, MANAGER

DALLAS, TEXAS, OFFICE, 227 ELM STREET
H. E. WELLS, AGENT

PITTSBURG, 611 EMPIRE BUILDING
W. ENNES, MANAGER

(OVER)

BUCKEYE GEM LAMPS

SATISFY YOUR CUSTOMERS

High Efficiency Units

Whiter and Brighter Light

Gem 50-Watt Lamps are the result of the most advanced theory in illumination and have proven their worth in practice. 20% more C. P. with approximately the same life and the same current consumption as the 16 C. P., 3.1-watt carbon lamp; or 20% less current than the 16 C. P., 3.1-watt carbon lamp with the same C. P. and a longer life. They are here to stay, and are destined, we believe, to supplant the present form of carbon filament lamps. Better learn more about it, and keep abreast of the great development in lamps that's going on right now.

Send for our special "Gem" Bulletin

THE BUCKEYE ELECTRIC CO.

Main Office and Works, CLEVELAND, OHIO

NEW YORK OFFICE 114 LIBERTY STREET
ARTHUR ORGAN, AGENT

CHICAGO, 23 EAST LAKE STREET
J. H. COOKE, MANAGER

DALLAS, TEXAS, OFFICE, 227 ELM STREET
H. E. WELLS, AGENT

PITTSBURG, 311 EMPIRE BUILDING
W. ENNES, MANAGER

BUCKEYE TANTALUM LAMPS

REDUCE YOUR PEAK LOAD

20 to 22 C. P. 40 to 44 Watt

For D. C. or 60 Cycle A. C. Circuits

3

You must use a "Buckeye" Tantalum to realize its value, which arises from the very high efficiency, being 2 W.P.C., and with a life of 600 hours, the quality of light produced is unequaled. Gives a white, strong light and is perfect in every way. State whether for D. C. or A. C. use when ordering.

Let us send you our "Tantalum" Bulletin

THE BUCKEYE ELECTRIC CO.

Main Office and Works, CLEVELAND, OHIO

NEW YORK OFFICE, 114 LIBERTY STREET
ARTHUR ORGAN, AGENT

CHICAGO, 23 E. LAKE STREET
J. H. COOKE, MANAGER

DALLAS, TEXAS, OFFICE, 227 ELM STREET
H. E. WELLS, AGENT

PITTSBURG, 611 EMPIRE BUILDING
W. ENNES, MANAGER

(OVER)

WHO SELLS BUCKEYE LAMPS NOT FAR AWAY?

THE FOLLOWING JOBBERS KEEP A LARGE SUPPLY OF BUCKEYE LAMPS OF EVERY KNOWN TYPE:

Frank H. Stewart Electric Co., Philadelphia, Pa.
Pettingell-Andrews Co., Boston, Mass.
The Post-Glover Electric Co., Cincinnati, Ohio
Dunham, Carrigan & Hayden Co., San Francisco, Cal.
Henry L. Walker Co., Detroit, Mich.
Nebraska Electric Co., Omaha, Neb.
Union Electric Co., Pittsburg, Pa.
Piedmont Electric Co., Anderson, S. C.
B. & C. Electrical Construction Co., Utica, N. Y.
Hide, Leather & Belting Co., Indianapolis, Ind.
W. C. Teas, Chattanooga, Tenn.
The Western Gas Fixture Co., Toledo, Ohio
The Erner & Hopkins Co., Columbus, Ohio
The Royse Electric Co., Indianapolis, Ind.
Kokomo Electric Construction Co., Kokomo, Ind.
Machine Electric Supply Co., Muncie, Ind.
Louisville Electric Supply Co., Louisville, Ky.
Geo. J. Lambrecht, Hannibal, Mo.
Butterworth & Reiter, Dayton, Ohio
O. J. Goettmann, Allegheny, Pa.
Dauphin Electrical Supplies Co., Harrisburg, Pa.
Springer & Patterson, Pittsburg, Pa.
Carter Electric Co., Pittsburg, Pa.
Chas. E. Sharp, Security Building, St. Louis, Mo., Special Agent Republic of Mexico

THE BUCKEYE ELECTRIC CO.

Main Office and Works, CLEVELAND, OHIO

NEW YORK OFFICE 114 LIBERTY STREET
ARTHUR ORGAN, AGENT

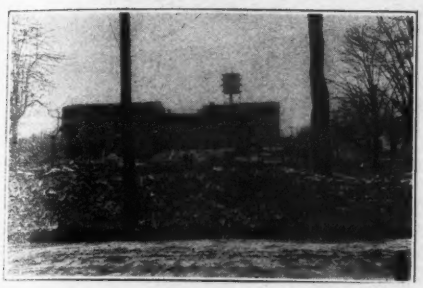
DALLAS, TEXAS, OFFICE, 227 ELM STREET
H. E. WELLS, AGENT

CHICAGO, 23 EAST LAKE STREET
J. H. COOKE, MANAGER

PITTSBURG, 611 EMPIRE BUILDING
W. ENNES, MANAGER

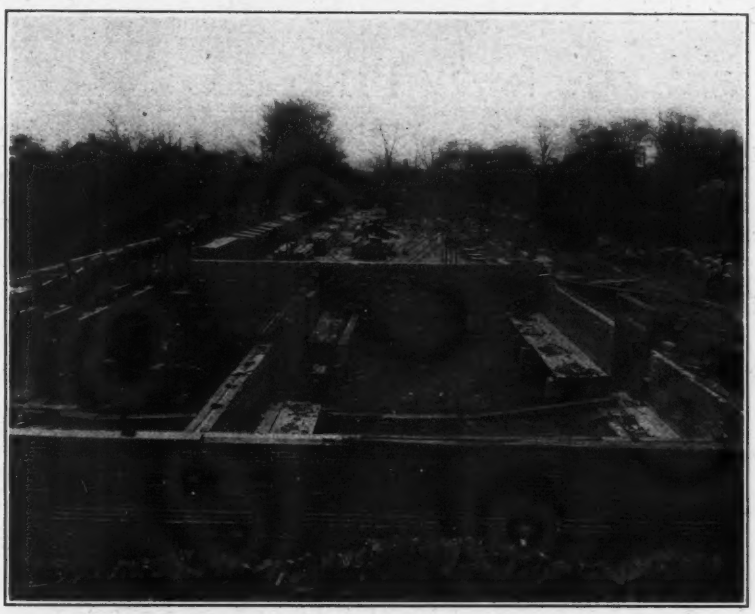
Watch Us Grow

The Evolution of a GREAT Lamp Factory



As our New Factory was April 1st
Conneaut, Ohio

As our New Factory was May 1st
Conneaut, Ohio



THE NEW "BRILLIANT" FACTORY

As it appeared just before the National Electric Light Convention

Have you stopped to consider what it means to have the most modern and best equipped FACTORY BEHIND THE LAMP? In size and completeness the new Brilliant Factory will be the most note worthy of the industry. This is the best evidence of the success and popularity of "BRILLIANT" lamps. Every detail that will assist in the manufacture of the best lamps obtainable will be embodied in the construction and equipment of the new Brilliant Factory. Our present factory continues in operation until our new factory is entirely completed. Our stock of lamps, including every known type, is sufficient to supply your immediate needs. Remember "BRILLIANT" lamps are shipped the same day your order is received, if you so desire.

The Brilliant Electric Company

GENERAL OFFICES: 403-404 ELECTRIC BUILDING
CLEVELAND, OHIO

LOOK FOR THE LICENSE LABEL

Advertise When You

(MOTTO—GEN. INC.

We have just secured the largest single installation of GEM Lamps in the world, the NEW PIERCE OFFICE BUILDING, St. Louis, Mo. In this building there are 7,614 sockets. 6,000 of these contain 50-watt, 20-C. P., G. I. GEM Lamps—1014 in the lobbies contain 50-C. P., G. I. GEM High Efficiency Units. This ought to speak for *quality*, because every lamp company in the United States tried for this contract, and *we got it.*

THE GENERAL INCAN.

1811 East 45th St. Cleveland, Ohio

N. B. GOOD AGENTS WANTED IN TERRITORIES NOT COVERED

Have Something to Say

LAMP COMPANY)

WE WERE THE LAST COMPANY TO PUSH THESE HIGH EFFICIENCY LAMPS, PREFERRING TO WAIT UNTIL WE WERE SURE OF THEIR BEING SATISFACTORY.

WE ARE NOW *SURE*, AND HAVE A LARGE STOCK. SO HAVE OUR AGENTS--WRITE TO THE NEAREST.

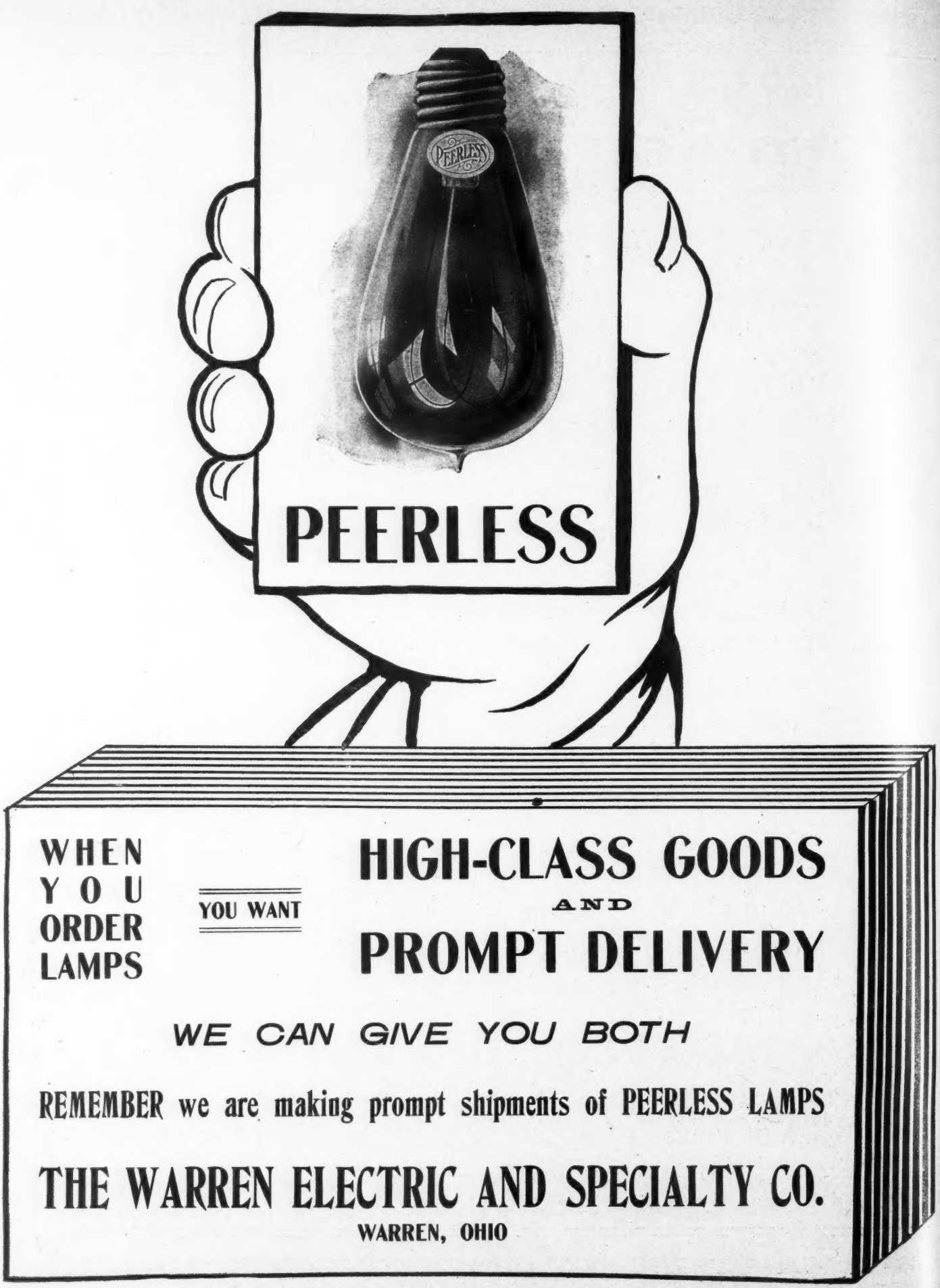
NOTICE WHO OUR AGENTS ARE--THE BEST IN THE COUNTRY:

M. B. Austin & Co., 133-141 West Jackson Boulevard Chicago, Ill.
Coast Electric Co., 312-314 San Pablo Avenue Oakland, Cal.
Christopher Electric Co., Beaumont, Tex.
Crosby, Craft & Co., 723 Williamson Building Cleveland, Ohio
Frank Adam Electric Co., 904-914 Pine Street St. Louis, Mo.
Hendrie & Bolthoff Mfg. & Supply Co., 1635 17th Street Denver, Colo.
Hobson Electric Co., 172-174 Commerce Street Dallas, Tex.
W. F. Irish Electric Co., 60 Cortlandt Street New York
Jackson & Earle, Stockton, Cal.
Mountain State Electrical Co., 911-913 Market Street Wheeling, W. Va.
Royse Electric Co., 125 S. Meridian Street Indianapolis, Ind.
Southern Electric Co., 423 North Calvert Street Baltimore, Md.

LAMP COMPANY

San Francisco Office 404 Atlas Building

N. B. GOOD AGENTS WANTED IN TERRITORIES NOT COVERED



WHEN YOU ORDER LAMPS

YOU WANT

HIGH-CLASS GOODS

AND

PROMPT DELIVERY

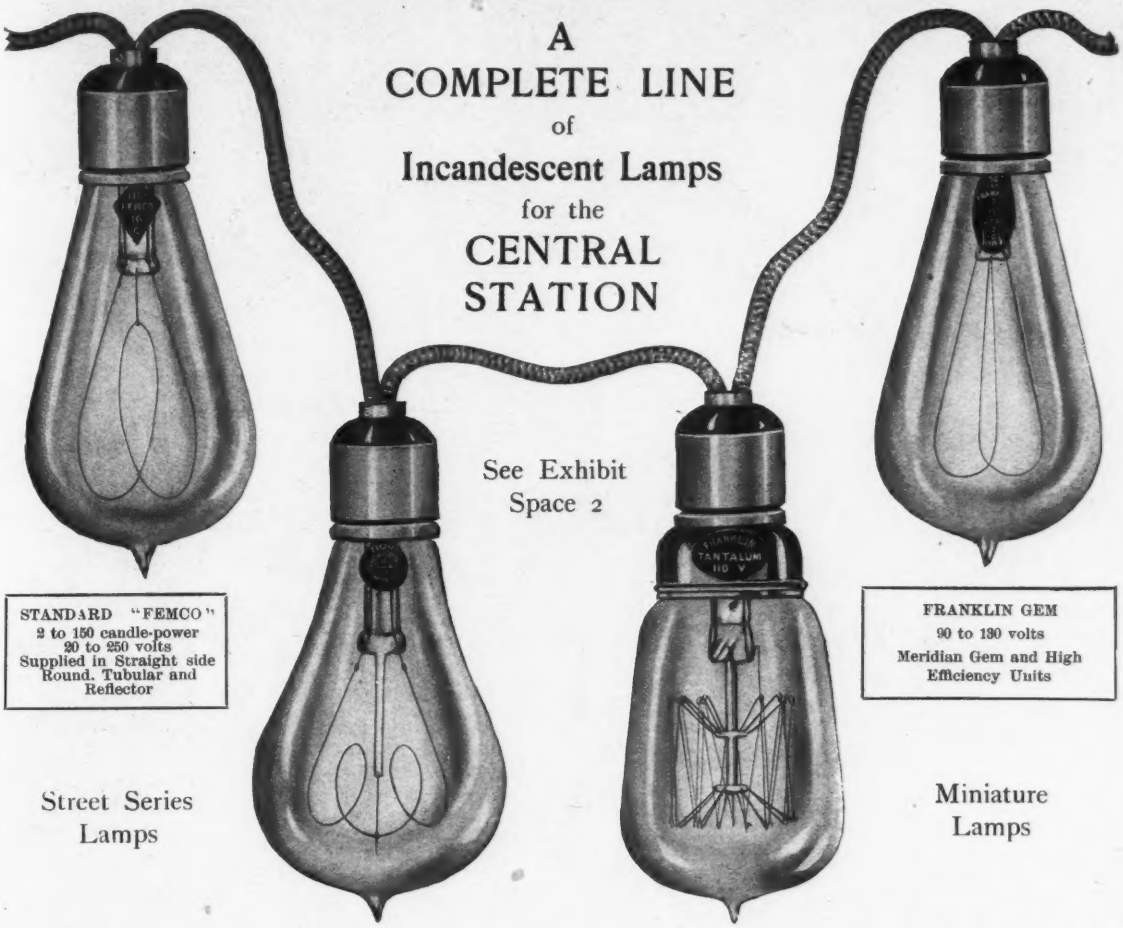
WE CAN GIVE YOU BOTH

REMEMBER we are making prompt shipments of PEERLESS LAMPS

THE WARREN ELECTRIC AND SPECIALTY CO.

WARREN, OHIO

A COMPLETE LINE of Incandescent Lamps for the CENTRAL STATION



See Exhibit Space 2

STANDARD "FEMCO"
2 to 150 candle-power
20 to 250 volts
Supplied in Straight side Round. Tubular and Reflector

Street Series Lamps

"NOVI" TYPE
8 to 50 c.p. 80 to 250 volts
3.1, 3.6, 4 watts per candle-power

FRANKLIN TANTALUM
2 watts per candle-power
25 and 50 candle-power
100 to 130 volts

FRANKLIN GEM
90 to 130 volts
Meridian Gem and High Efficiency Units

Miniature Lamps

We Solicit Correspondence with
Lighting Companies Having Rigid Specifications

The Franklin Electric Manufacturing Co.

General Office: HARTFORD, CONN.

Factories: HARTFORD and MIDDLETOWN, CONN.

Branch Offices and Stock Rooms

NEW YORK
26 Cortlandt St.

CHICAGO
602 Fisher Bldg.

BUFFALO
121 Franklin St.

BALTIMORE
2011 E. North Ave.

ST. LOUIS
1414 Chestnut St.

PHILADELPHIA
1022 Arch St.

Pacific Coast Representatives

SAN FRANCISCO
Holabird-Reynolds & Sayles Co.

LOS ANGELES
Holabird-Reynolds Elec. Co.

FOSTORIA

THE
"FAMOUS
FOSTORIA
FORTY-FIVE"

THAT'S WHAT IT IS—

A lamp of Standard Shape and size giving 16 full horizontal candle-power and consuming 45 watts (total), with a useful life, under normal conditions, of 1,000 hours. There's no mystery about the candle-power—no uncertainty about the watts.

It's just a straight, honest lamp that will do exactly what we tell you and we'll tell you ALL about it.

You can substitute it for the ordinary 3.5 watt lamp without loss of light in any direction and save 11 watts per lamp and get 200 hours more useful life.

Write us about it—also get our bulletins on all types of GEM LAMPS—TANTALUM LAMPS, etc.

THE FOSTORIA INCANDESCENT LAMP CO.

FOSTORIA, OHIO

COLUMBIA

BULLETIN

Jan. 14, 1907 Copyright 1907, by Engineering Department National Electric Lamp Association Bulletin No. 4

Gem Metallized, High Candle Power and Prismo, Lamps and Units

SPECIAL LAMPS

ALL TYPES
ALL VOLTAGES
ALL CANDLE POWERS

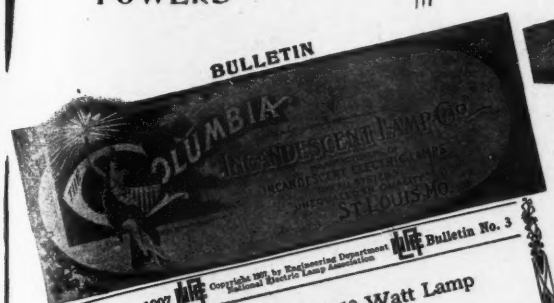
Gem High Candle Power Unit with Type D Holophane Reflector

WE CAN FURNISH

ANY KNOWN TYPE OF INCANDESCENT LAMP

A LARGE STOCK ON HAND READY FOR SHIPMENT

BULLETIN



Jan. 14, 1907 Copyright 1907, by Engineering Department National Electric Lamp Association Bulletin No. 3

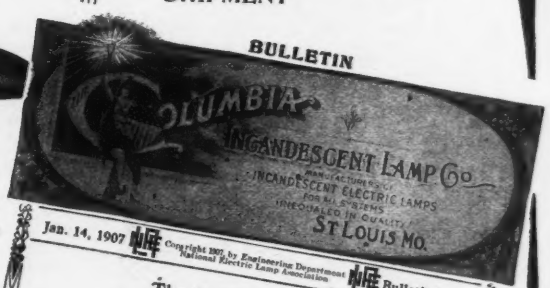
The Gem Metallized 50 Watt Lamp

Fig. 1

A copy of these bulletins, together with prices, etc., will be mailed on request

Send for them

BULLETIN



Jan. 14, 1907 Copyright 1907, by Engineering Department National Electric Lamp Association Bulletin No. 5

The Tantalum Lamp

Fig. 1

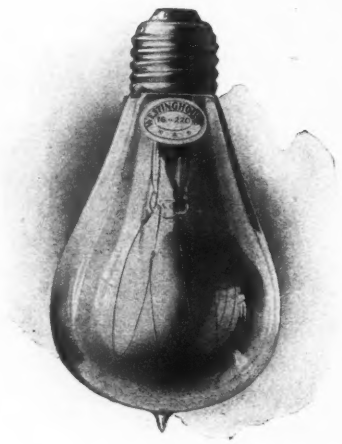
The COLUMBIA INCANDESCENT LAMP CO.

ST. LOUIS, MO., U. S. A.

Branch Offices—Lamps in Stock

NEW YORK: Taylor Building, 39-41 Cortlandt Street CHICAGO: 264-270 Fifth Avenue PITTSBURG: 705 Penn Building
PHILADELPHIA: 1221 Real Estate Trust Building MEMPHIS: 26 Randolph Building MEXICO—Monterey: Sanford & Cia.

WESTINGHOUSE LAMPS



THE NAME IS
YOUR
GUARANTEE

ALL TYPES
ALL CANDLES
ALL VOLTAGES

WESTINGHOUSE LAMP CO.

510 WEST 23d STREET, NEW YORK

Sales Offices:

Atlanta, Baltimore, Boston, Buffalo, Butte, Salt Lake City, Charlotte, Chicago, Cincinnati, Cleveland, Columbus, San Francisco, Dallas, Denver, Detroit, Joplin, Kansas City, Seattle, Los Angeles, Louisville, Milwaukee, Minneapolis, New Orleans, Syracuse, New York, Philadelphia, Pittsburg, Richmond, St. Louis

Factories:

512-534 West 23d Street, New York, N. Y.
and Bloomfield (Watsessing) New Jersey

THIS, THEN, IS TO ANNOUNCE

that in the future Central Station managers may give free renewals of 4, 8 or 32-C. P. lamps and receive in return the same percentage of revenue on their investment as they do on a 16-C. P. lamp.

How can you do this?

Why, by purchasing the new line of

STERLING SPECIAL LAMPS

A line of lamps which have been rated on a logical basis, so that an 8-C. P. lamp will live long enough to consume as many K. W. hours during its life as a 16-C. P. lamp, the cost of the 8 and 16-C. P. lamps being the same.

A line in which the 32-C. P. lamps are designed to consume during their life just a little less than twice the K. W. hours consumed by a 16-C. P. lamp. This is because the cost of a 32-C. P. lamp is not quite twice the cost of a 16-C. P. lamp.

What's the result?

Solely and simply this: That Central Station men for the first time in history of their business are able to decrease their expenses and increase their income on the 8-C. P. lamp and decrease the expense to the consumer on the 32-C. P. lamp.

They know without any doubt or guesswork, that on their expenditure for lamps, whether 8, 16 or 32-C. P., that their percentage of revenue is exactly the same. This new line of Sterling Special Lamps is an innovation in the lamp field—it has no competitor—it is unique, peculiar and distinctive.

Besides, the lamps themselves are far superior to any carbon filament lamp now in the market—the highest efficient, the longest lived, the best distributers of light.

They fill the eye, fit the discriminating intellect and lend a peace like a dress that fits in the back.

Be your own best friend and drop a line for further particulars, prices, etc., addressed to

The Sterling Electrical Mfg. Co.

WARREN, - - - - OHIO

THE QUESTION OF THE DAY

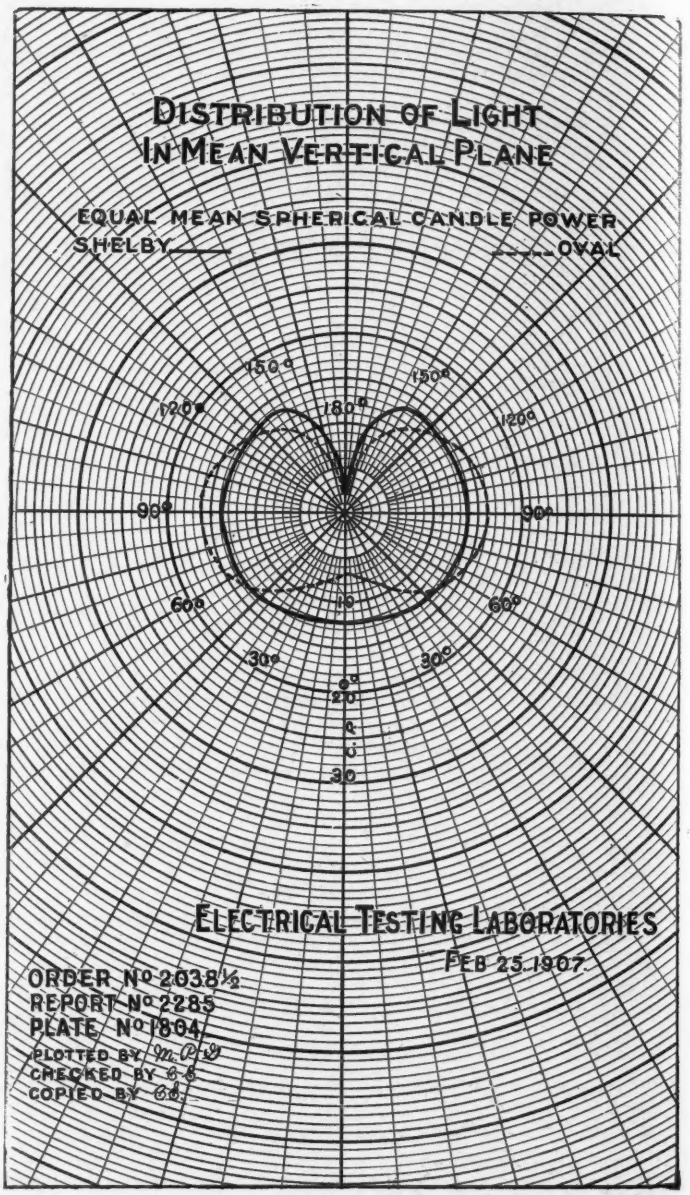
WHERE IS THE LIGHT MOST VALUABLE?

NOTE:
LAMPS TAKING SAME CURRENT, GIVING EQUAL SPHERICAL CANDLE POWER, HAVE THE SAME LIFE.

The diagram shows results of tests made of Shelby Useful Light Lamps against Oval Filament Lamps. Both lamps had the same spherical candle power, same current consumption, same life, first cost the same. The Shelby type gives

70 PER CENT MORE USEFUL LIGHT

Everyone concedes that the light below the lamp is the USEFUL LIGHT. Send us your next order.



LOOK FOR THE LICENSE LABEL

THE SHELBY ELECTRIC CO.

SHELBY, OHIO, U. S. A.

BRANCHES.

Boston, Detroit, New York, Louisville, Philadelphia, St. Louis, Chicago, San Francisco, Baltimore, Indianapolis, Pittsburg, Portland, Cleveland, Atlanta, Cincinnati, Washington, D. C.

BRANCHES.

ELK
Factory
EMPORIUM, PENN.

XL
CP V
Factory
ST. MARYS, PENN.

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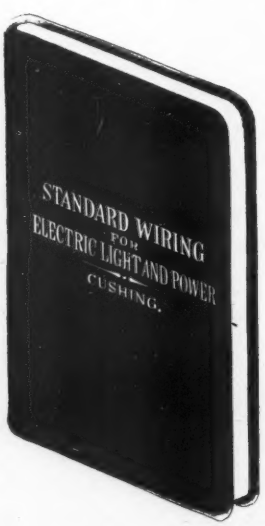

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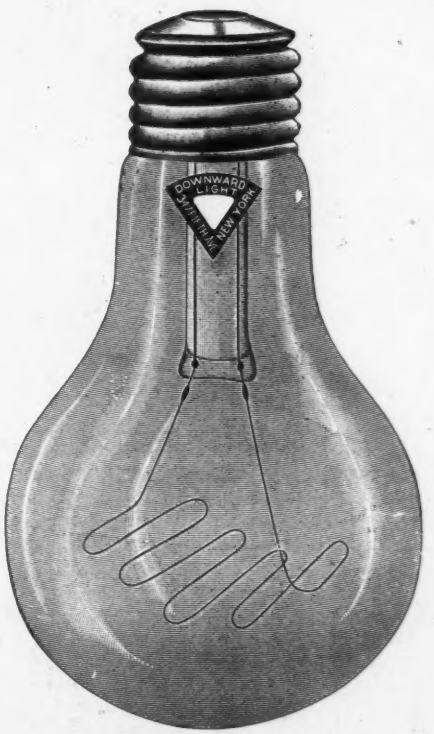

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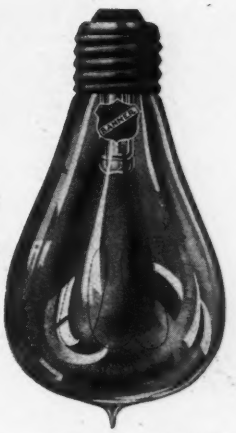

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give an even, widely diffused quality of light; which is more like daylight than the light obtained from other electric lamps.

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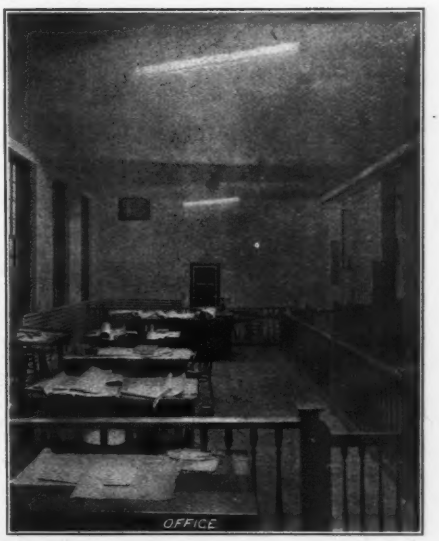

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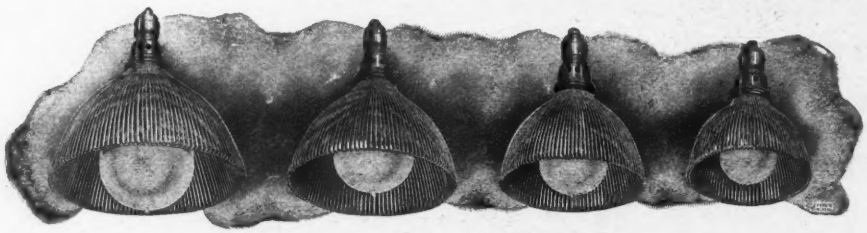

Form B Units furnish higher values and a wider area of uniform light distribution beneath the lamp than any other form of reflector or electric lamp available for uniform lighting.

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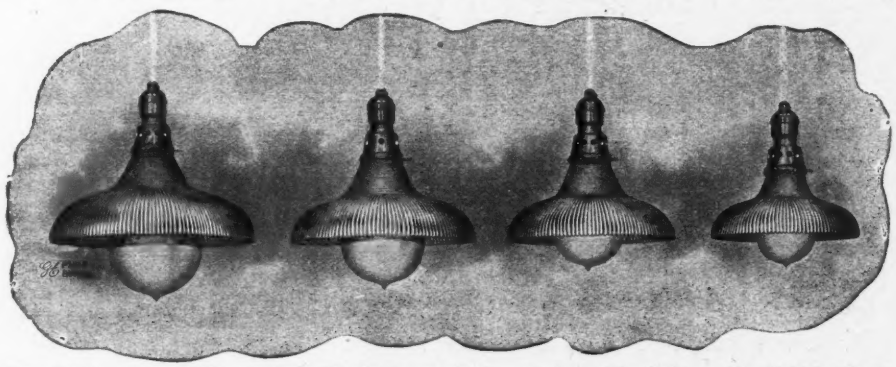

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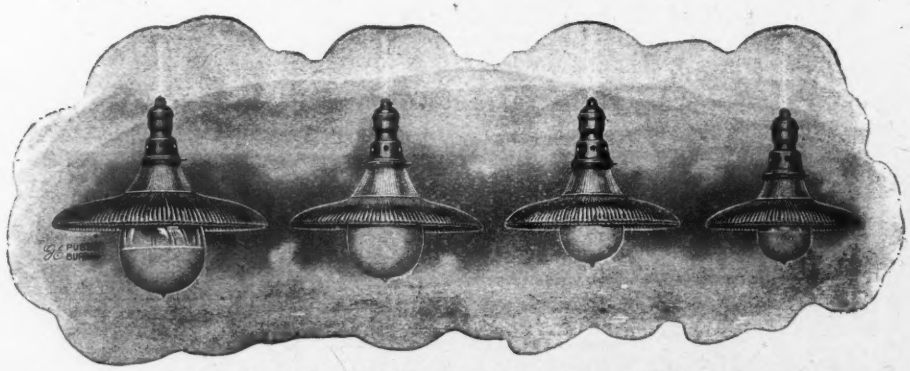

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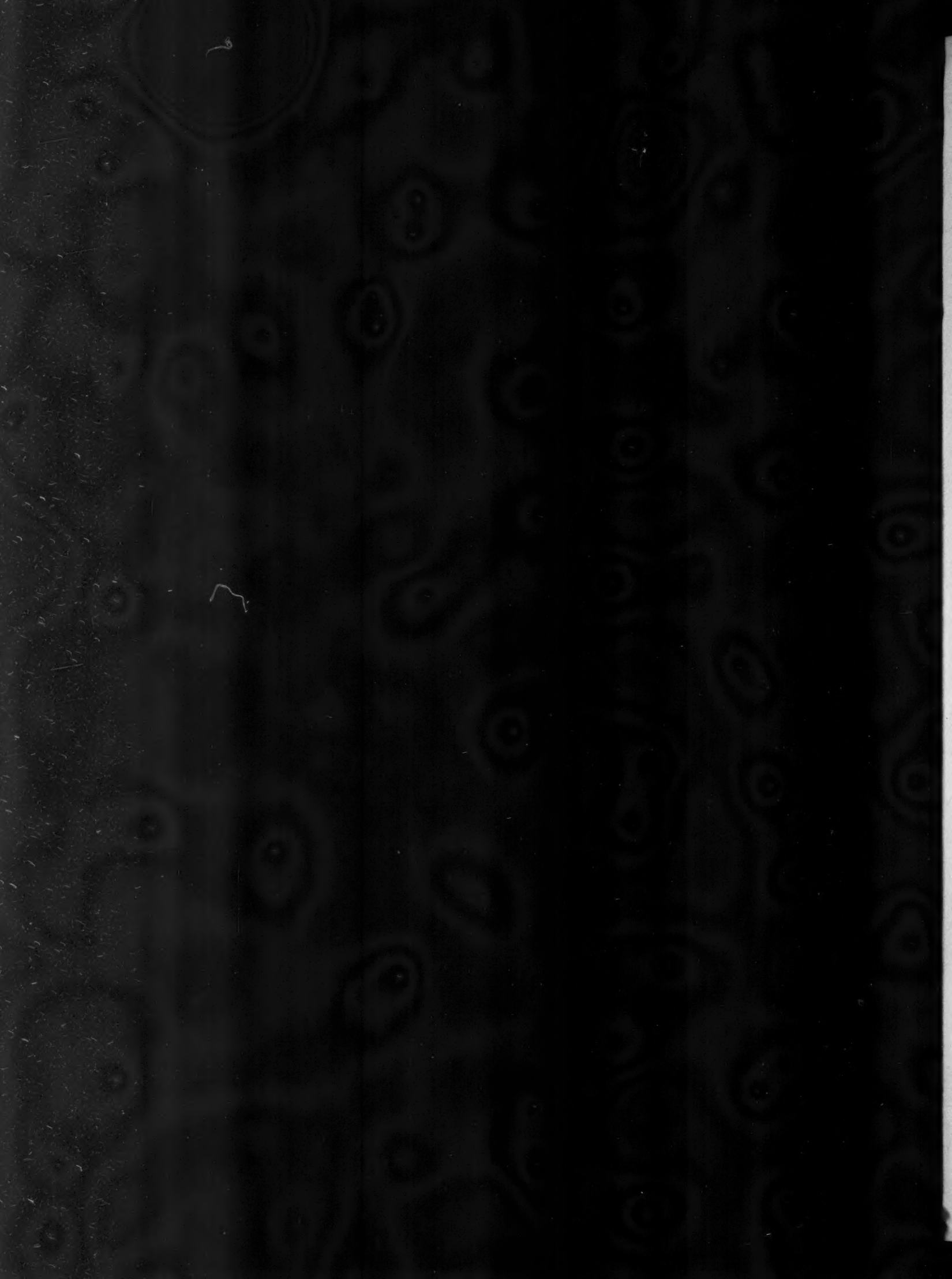

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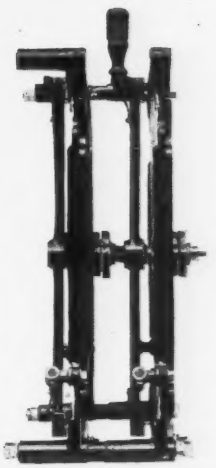

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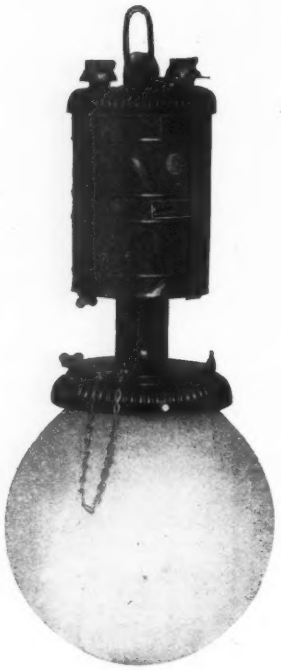

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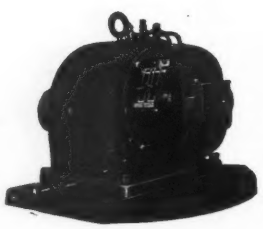

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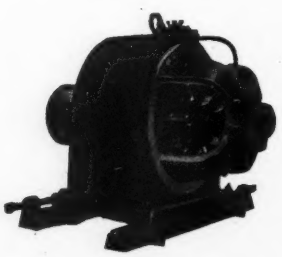

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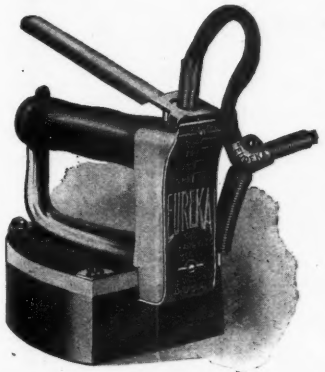

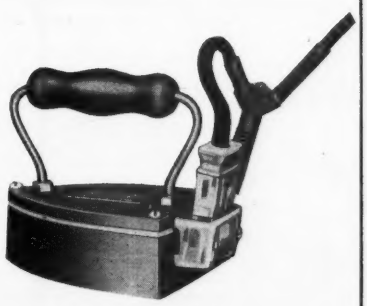

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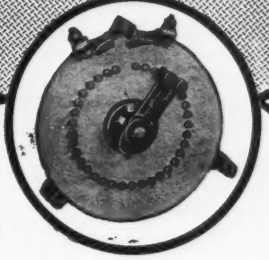

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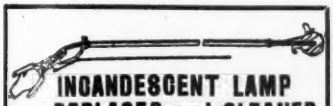
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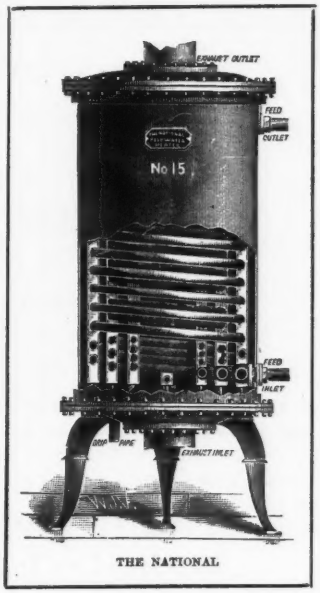

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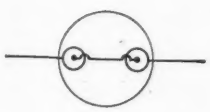

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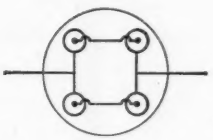

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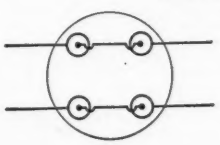
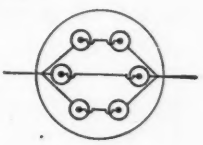
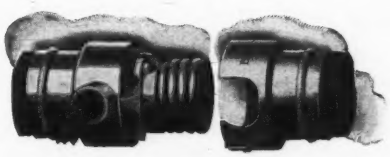
220-VOLT   CIRCUITS



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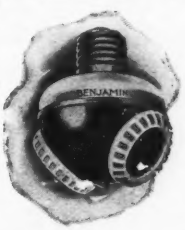

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(SEE NEXT PAGE)

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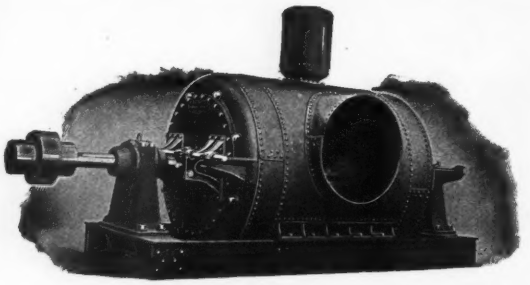

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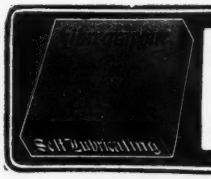

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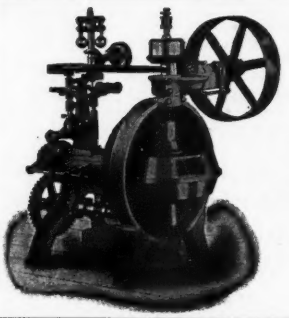

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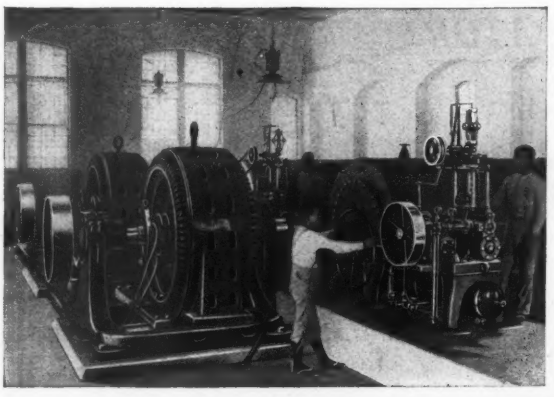

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3-4	17.33	178	84	138	83.88 " "
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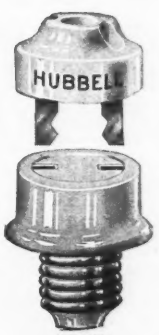

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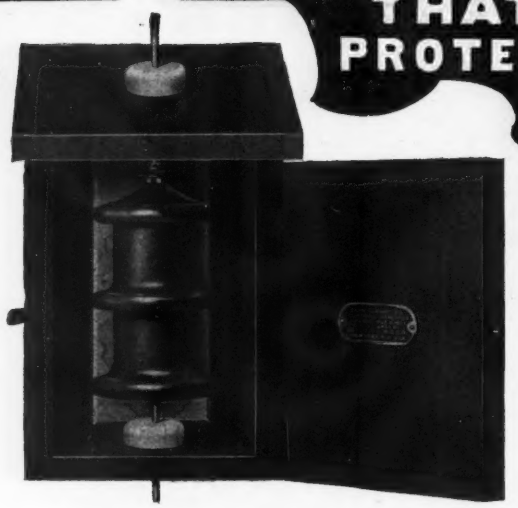

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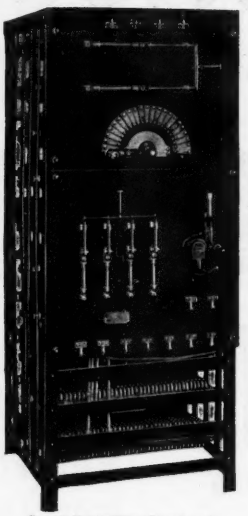

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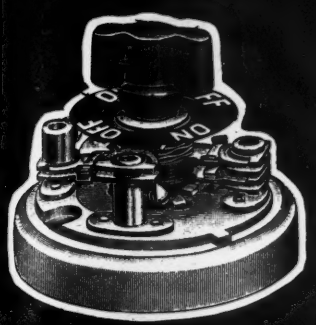

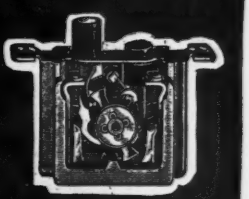

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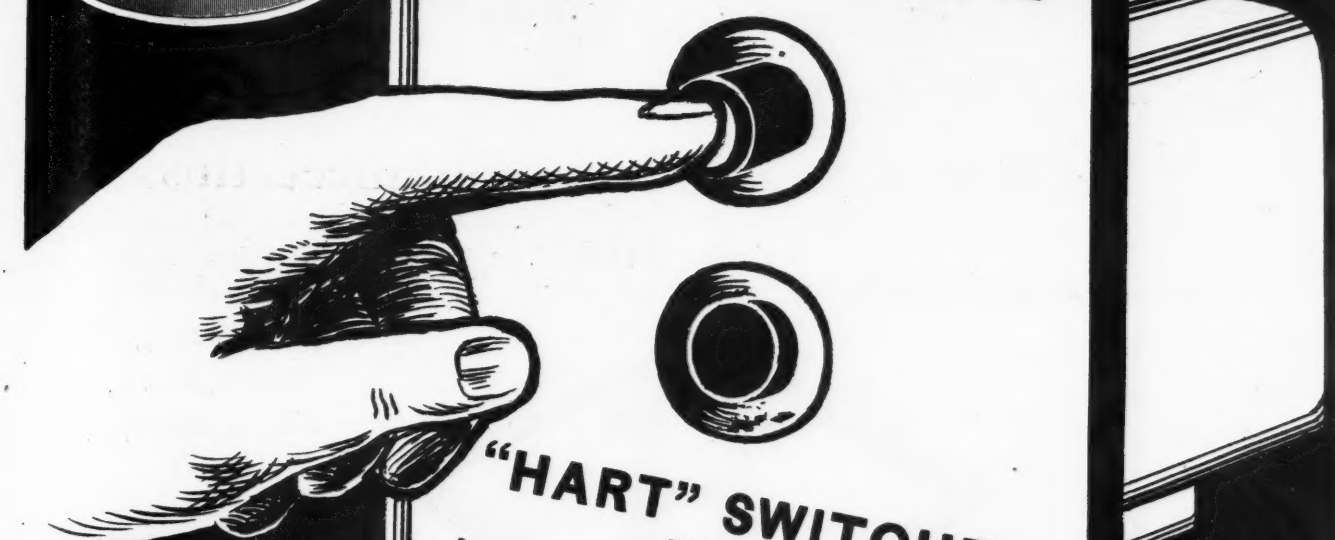

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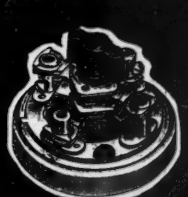

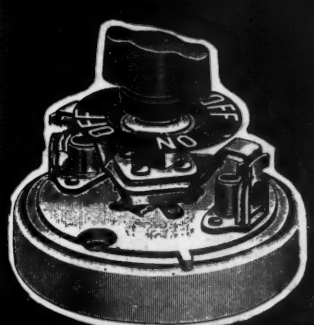

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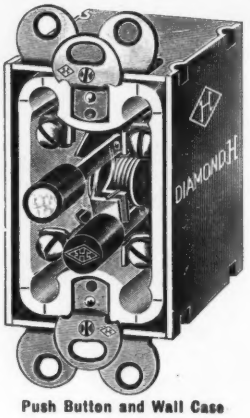
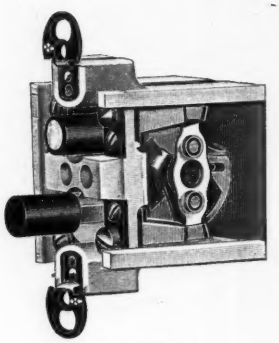


Push Button and Wall Case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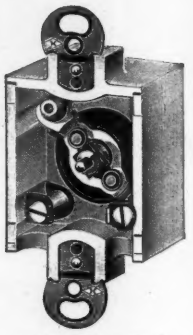
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Trade Mark

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Rotary Flush Switch

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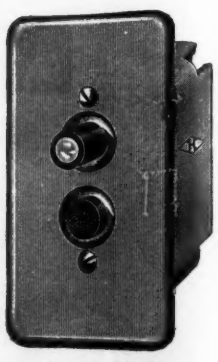
Flush Push Switch

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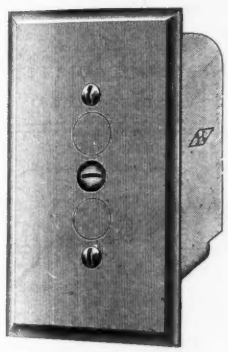
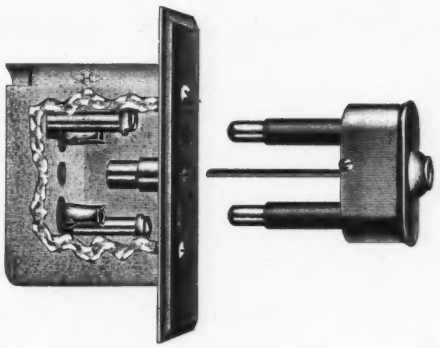
HARTFORD

New York Boston Chicago Denver

SWITCHES



Automatic Flush Receptacle



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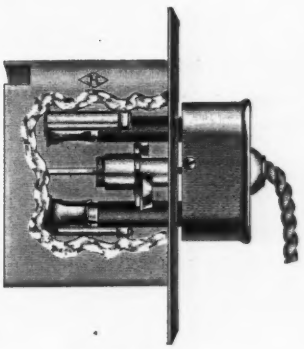

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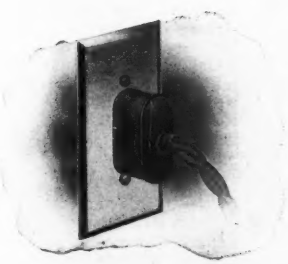
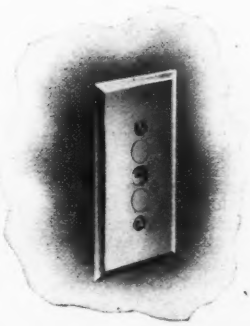


Flush Receptacle with Plug



Flush Receptacle, Plug Withdrawn

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CONN., U. S. A.

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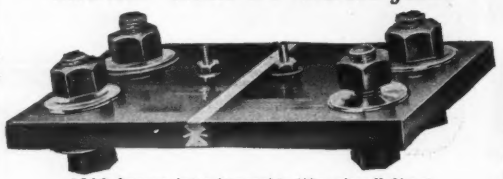

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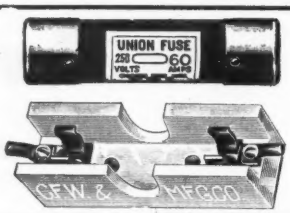

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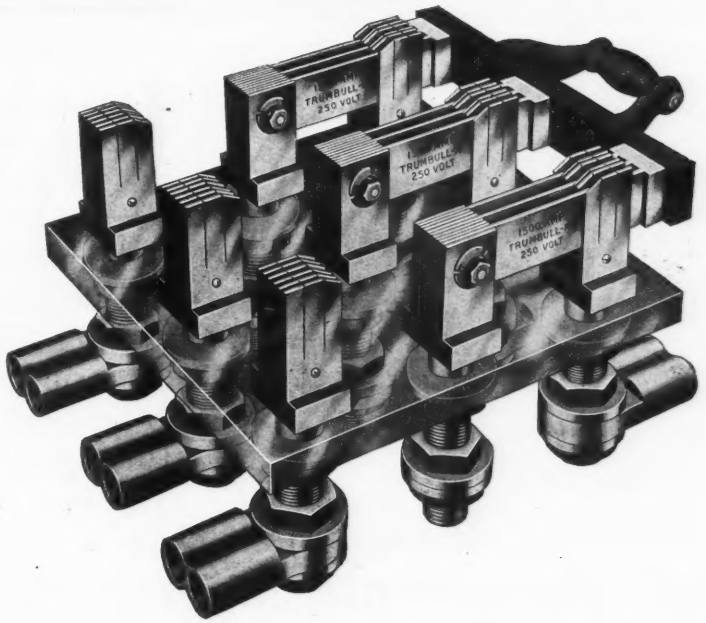

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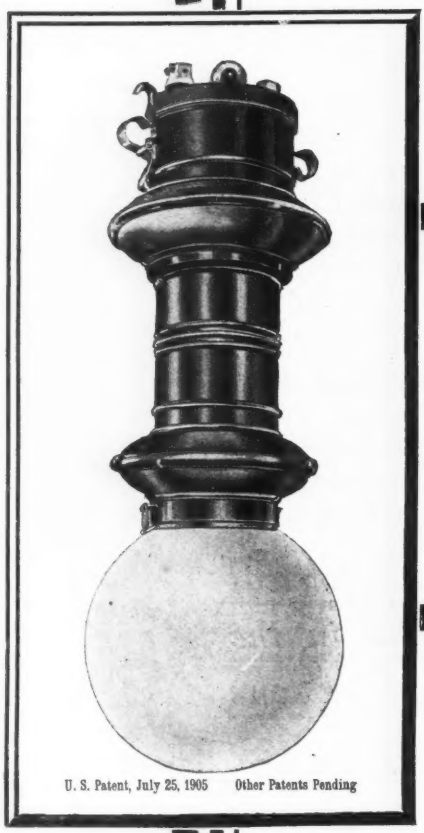

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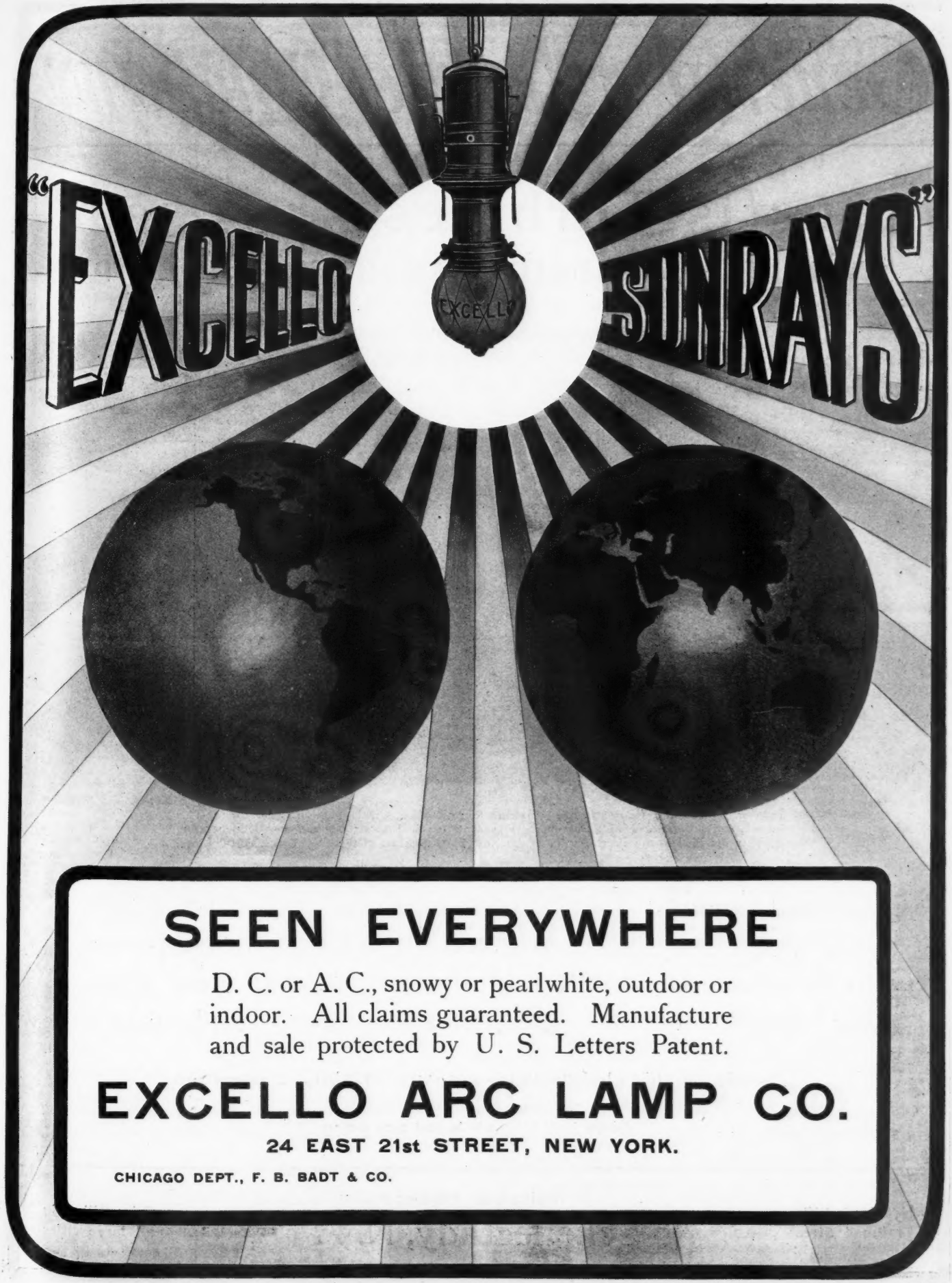

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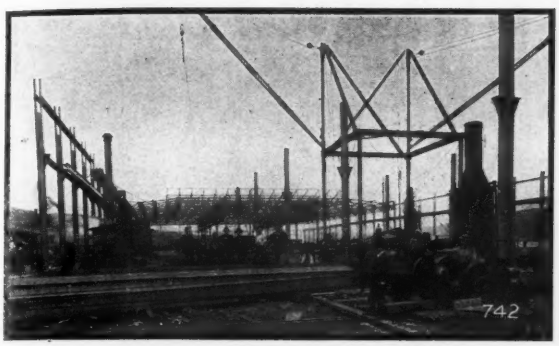

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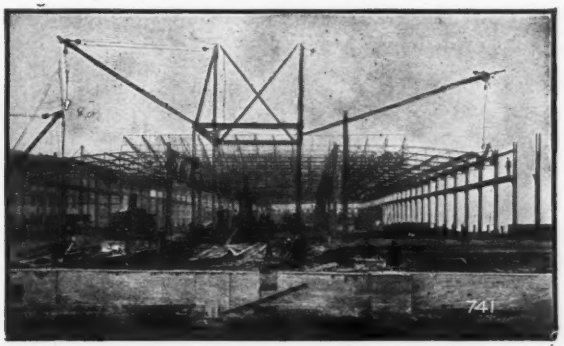

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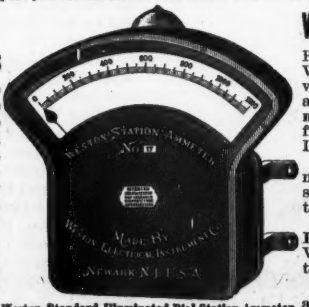

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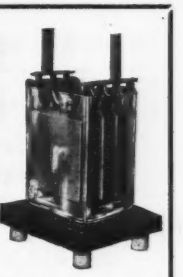

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Total number of Exchange Stations in service in the Chicago Telephone Company's system:

January, 1907 ..	173,974
" 1897 ..	15,085
Gain	158,889

Measured Service was introduced March, 1897. Over 90% of the Stations gained during the past ten years are Measured Service. 8,448 Stations gained during the first three months of this year, of which over 92% are Measured Service.

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203 Washington Street, Chicago, Ill.

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All read the ELECTRICAL REVIEW. Ask them.
Advertisers should remember this fact.

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The perfect Arc. Price, $10 wholesale
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SIMPLE — ECONOMICAL — DURABLE

ESPECIALLY ADAPTED TO DRIVING ELECTRIC GENERATORS

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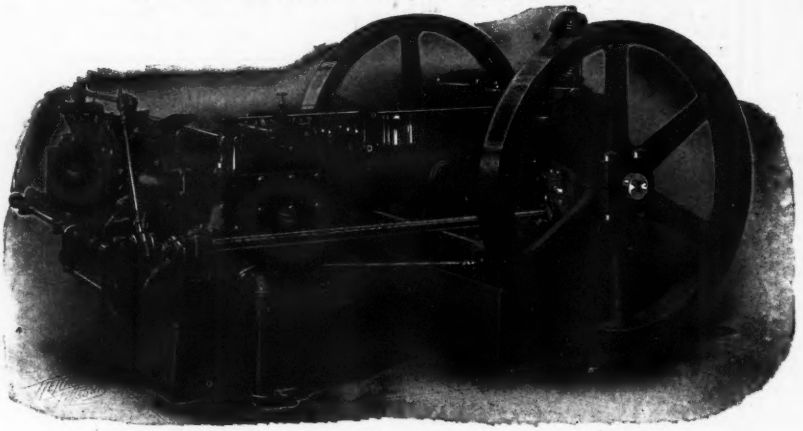

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25 HORSE-POWER TO 500 HORSE-POWER

500 HORSE-POWER TO 6000 HORSE-POWER

500 HORSE-POWER TO 6000 HORSE-POWER

WE STILL MAINTAIN OUR REPUTATION FOR INDEPENDENT THOUGHT AND ACTION, AND FOR KEEPING ABREAST OF THE TIMES; AND IN PRESENTING THE BUCKEYE GAS ENGINE, ENGINEERS AND PURCHASERS WILL NOTE THAT WE ARE ORIGINATORS AND LEADERS IN THIS NEW LINE, AS WE ALWAYS HAVE BEEN IN OUR STEAM ENGINE PRACTICE.

WE CUT FROM NEW CLOTH

WRITE US WHEN WANTING EITHER GAS OR STEAM ENGINES

CLASSIFIED INDEX—(*Continued from page 73*)

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MAGNETIC SOLENOIDS
The Electric Controller & Supply Co.
Cutler-Hammer Mfg. Co.

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American District Steam Co.
New Process Raw Hide Co.
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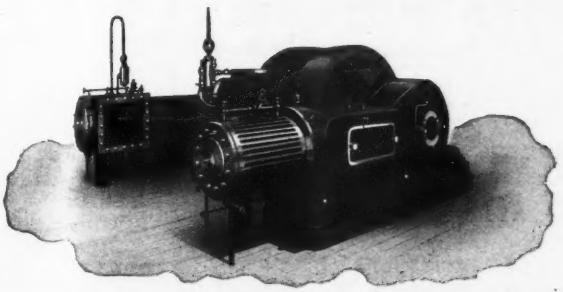
(*Continued on page 97*)

1881 AUTOMATIC and CORLISS FOR ELECTRIC and POWER SERVICE 1907



Our reputation for building a high-grade engine in the past is fully sustained by our product to-day, which is superior in workmanship, material and design to anything we have ever put on the market.

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In operation at our show room, 126 Liberty Street

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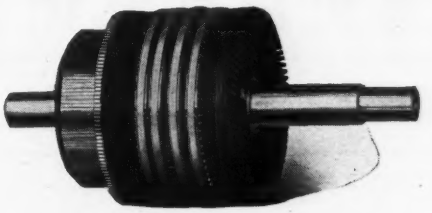
Oil Mill Machinery — Feed Water Heaters
Agencies in Principal Cities.

Dynamo and Motor Capacity



The maximum power which can be sustained by a dynamo or motor depends chiefly upon its tendency to develop heat in the armature. The quantity of heat which an armature is capable of *radiating* depends upon the amount of air circulating through it, or, in other words, upon the *efficiency of armature ventilation.*

We have devoted special study to this subject of armature ventilation in AMERICAN-BALL DYNAMOS and MOTORS, and we want to tell you how well we've succeeded.

Write for our new booklet, "Armature Heating—Its Causes, Abatement and Suppression."

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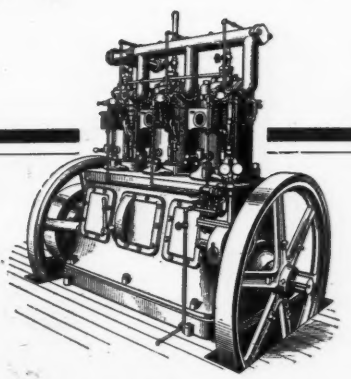
Manufacturers of American-Ball Simple and Compound Engines and Direct Current Electrical Machinery
48 Raritan Ave., Bound Brook, N. J.



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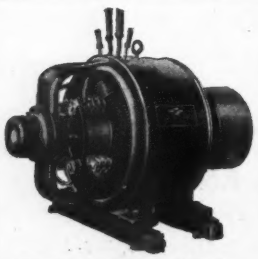
All three features are patented and controlled by us exclusively, in the United States, Canada and Mexico. For further details see our Bulletin 1054.

IF YOU ARE *in the* MARKET *for* MOTORS

WE CAN FURNISH WHATEVER YOU NEED, IN SIZES FROM 1 H. P. UP, FOR EITHER DIRECT OR ALTERNATING CURRENT

The illustration shows four of our standard Induction Motors driving pumps in a large pulp and paper mill.

This plant is equipped throughout with Allis-Chalmers Motors of the same design.



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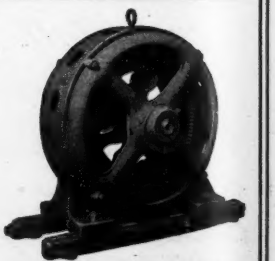

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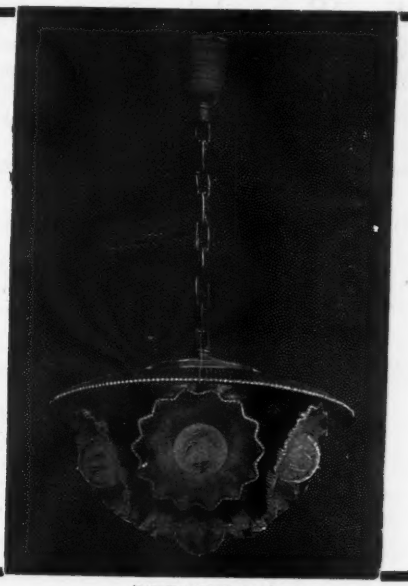

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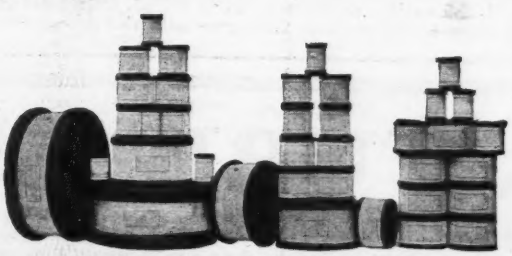

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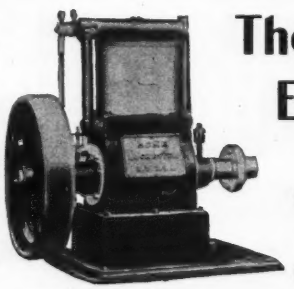

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Rochester Machine Tool Works
Limited
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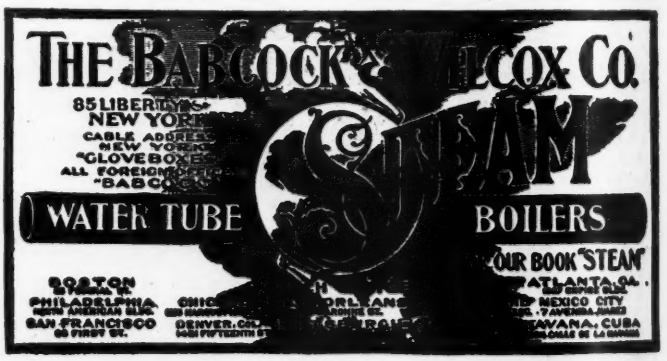
(2)



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STENCILS
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STOKERS
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TELEPHONES
American Electric Telephone Co.
Atwater-Kent Mfg. Co.
Automatic Electric Co.
Central Electric Co.
Connecticut Tel. & Elec. Co.
Couch Co., S. H.
Doubleday-Hill Electric Co.
Electric Goods Mfg. Co.
Kellogg Switchboard & Supply Co.
Manhattan Electrical Supply Co.
Novelty Electric Co.
Stanley & Patterson
Stromberg-Carlson Tel. Mfg. Co.
Wesco Supply Co.
Western Electric Co.
Wire & Telephone Co. of America

TELEPHONE SERVICE
American Bell Telephone Co.
Chicago Telephone Co.
New York Telephone Co.

THEATRE DIMMERS
Cutler-Hammer Mfg. Co.
Simplex Electric Heating Co.
Ward Leonard Electric Co.
Wirt Electric Co.

TESTING
Electrical Testing Laboratories

TIES, CROSS-ARMS, BRACKETS, PINS, CLIMBERS, ETC.
Brady, T. H.
Central Electric Co.
Klein & Son, Mathias
Morris Co., Elmer P.

TIME SWITCHES
Anderson, Albert & J. M.
Electric Motor & Equipment Co.
Hartford Time Switch Co.
Manhattan Electrical Supply Co.

TOOLS
Jessops & Sons, Wm.

TOOLS
Klein & Sons, Mathias

TRANSFORMERS
{ Allis-Chalmers Co. } { Bullock Electric Mfg. Co. }
Crocker-Wheeler Co.
Doubleday-Hill Electric Co.
Fort Wayne Electric Works
General Electric Co.
Lafayette Electrical Mfg. Co.
New York & Ohio Co.
Wagner Electric Mfg. Co.
Wesco Supply Co.
Western Electric Co.
Westinghouse Electric & Mfg. Co.

TROLLEY WHEELS
Doubleday-Hill Electric Co

TURBINE GOVERNORS
Allis-Chalmers Co.
Lombard Water-Wheel Gov. Co.

TURBINES, STEAM
Allis-Chalmers Co.
General Electric Co.
Leffel & Co., Jas.
Westinghouse Machine Co.

TURBINES, WATER
Allis-Chalmers Co.
Platt Iron Works Co.

UNCOATED ARMATURE TAPES AND SLEEVINGS
Dunton & Co., M. W.

VACUUM DRYING APPARATUS
Devine Co., J. P.

VARNISH, INSULATING
DeVoe & Co., F. W.
Massachusetts Chemical Co.
Standard Varnish Co.
Sterling Varnish Co.

WATER-POWER PLANTS AND EQUIPMENT
Platt Iron Works Co.

WATER-WHEELS
Allis-Chalmers Co.
Leffel & Co., Jas.
Platt Iron Works Co.

WATER-WHEEL GOVERNORS
Allis-Chalmers Co.
Lombard Water-Wheel Co.
Woodward Governor Co.

WINDING MACHINERY
Aiton Machine Co.
American Insulating Machinery Co.
New England Butt Co.

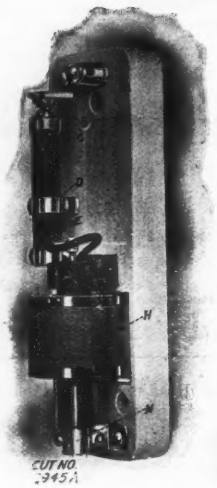
WIRE CONNECTORS
Doubleday-Hill Electric Co.

WIRES AND CABLES
American Electrical Works
Atlantic Insulated Wire & Cable Co.
Belden Manufacturing Co.
Bishop Gutta Percha Co.
Bridgeport Brass Co.
Central Electric Co.
Chicago Fuse Wire Mfg. Co.
Crescent Insulated Wire & Cable Co.
Detroit Insulated Wire Co.
Dielectric Co. of America
Doubleday-Hill Electric Co.
Electric Cable Co.
General Electric Co.
Hazard Mfg. Co.
Illinois Electric Co.
India Rubber & Gutta Percha Insulating Co.
Indiana Rubber & Insulated Wire Co.
Lawrence Electric Co., F. D.
Lowell Insulated Wire Co.
Marion Insulated Wire & Rubber Co.
Moore, Alfred F.
National Conduit & Cable Co.
National India Rubber Co.
New York Insulated Wire Co.
Okonite Co., The
Partrick, Carter & Wilkins Co.
Phillips Insulated Wire Co.
Phosphor-Bronze Smelting Co., Ltd.
Roebling's Sons Co., John A.
Simplex Electrical Co.
Standard Underground Cable Co.
Waterbury Co.
Wesco Supply Co.
Western Electric Co.
Wire & Telephone Co. of America

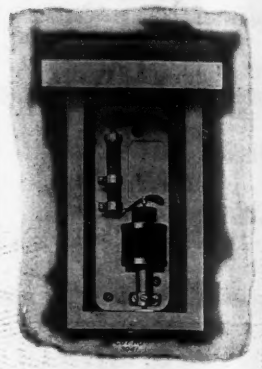
WIRE ROPE MACHINERY
Aiton Machine Co.

DO YOU KNOW THAT

Any Excess Voltage Will Mean



LOSS OF SERVICE
REPAIRS
INCONVENIENCE



Proper Protection and Efficient Service are secured when the path for the lightning discharge is of lower resistance than the insulation of the apparatus, and when the lightning arresters will cut off the flow of normal current after the discharge.

In Garton-Daniels Arresters the discharge path has a smallest possible air-gap, and a non-inductive path of the lowest possible ohmic resistance. The flow of normal current is not broken at the air-gap, but between the armature and the carbon.

Many other points of merit found in no other arrester are described in our new Bulletin No. 25.

ELECTRIC SERVICE SUPPLIES CO.

"Supplies for Every Electric Service"

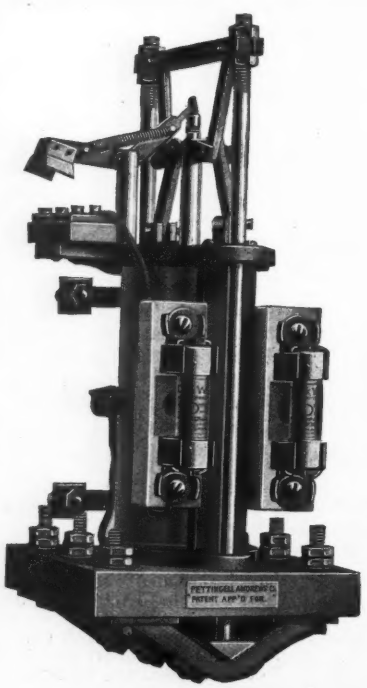
MAYER & ENGLUND DEPT. PHILADELPHIA

GARTON-DANIELS DEPT. KEOKUK

PORTER & BERG DEPT. CHICAGO

BRANCHES

NEW YORK PITTSBURG SAINT LOUIS ATLANTA



DO NOT FAIL TO VISIT OUR EXHIBIT

Wall Booth No. 3

See Our Remote Control Switch in Operation

The Central Station Supply House

WIRES OKONITE CABLES

TRADE MARK.

THE STANDARD FOR RUBBER INSULATION

PETTINGELL-ANDREWS COMPANY

BOSTON, MASS.

A Complete Line of Electrical Supplies

RAILWAY ELECTRIC LIGHT TELEGRAPH AND TELEPHONE SUPPLIES

FOR IMMEDIATE SHIPMENT

LARGEST STOCK IN THE WEST

Okonite Wires
Okonite Tape
Manson Tape

OKONITE
TRADE MARK
REG. U.S. PAT. OFFICE.

Candee Weatherproof Wires

PROMPT SHIPMENTS

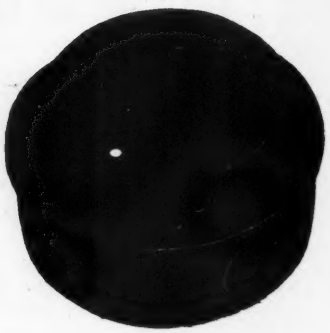
"Flexduct," Noark Fuse and Blocks, made by H. W. Johns-Manville Co. Femco and Columbia Incandescent Lamps, G. I. Arc Lamps, Columbia Dry Batteries, made by the National Carbon Co. Samson Batteries made by the Electric Gas Light Co. Bossert Boxes and Supplies. Hart & Hegeman and Perkin's Switches.

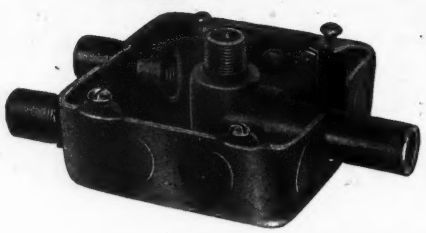
WRITE FOR PRICES ON WHAT YOU WANT

THE F. D. LAWRENCE ELECTRIC COMPANY
219 WEST FOURTH STREET CINCINNATI, OHIO

BOSSERT

DRAWN STEEL BOXES





ARE BETTER THAN CAST-IRON BOXES

According to the unanimous decision of thousands of electricians who have used them.

ONE REASON for their satisfaction is the fact that they will not break. ANOTHER REASON is—there is no filing or reaming and you can drive the hermetically sealed outlets with one sharp blow of the hammer producing a clean round hole the size of your pipe or conduit, they save considerable time and cost of labor over the ordinary cast-iron KnockOut boxes.

We furnish the contractor any kind of a box necessary to a complete installation and will gladly quote on special boxes on receipt of specifications.

The Bossert Electric Construction Company

UTICA, NEW YORK

A OF

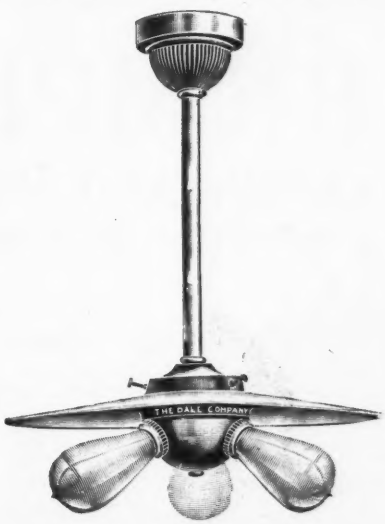
MONEY IS SAVED

BY USING

DALE'S WIRELESS CLUSTERS

TRY THEM TO PROVE OUR CLAIMS

CAN BE INSTALLED
IN ONE-FIFTH
THE TIME IT TAKES
TO INSTALL OTHER
WIRELESS
CLUSTERS



THE *EASIEST* TO INSTALL
BECAUSE YOU DON'T
HAVE TO REMOVE RINGS
TO CONNECT UP

TERMINALS EXPOSED TO
VIEW WHEN CAP IS
REMOVED

HALF TURN SECURELY LOCKS CAP IN CLUSTER SHELL. THEREFORE THEY ARE

GREAT LABOR SAVERS

WRITE FOR CATALOG No. 15,
JUST ISSUED

THE DALE COMPANY

9th Avenue 13th and Hudson Streets, - - - - - - - - - - - - - - - - - - New York City

"Camp Duct"

is known for its permanency through all time.

"CAMP DUCT"

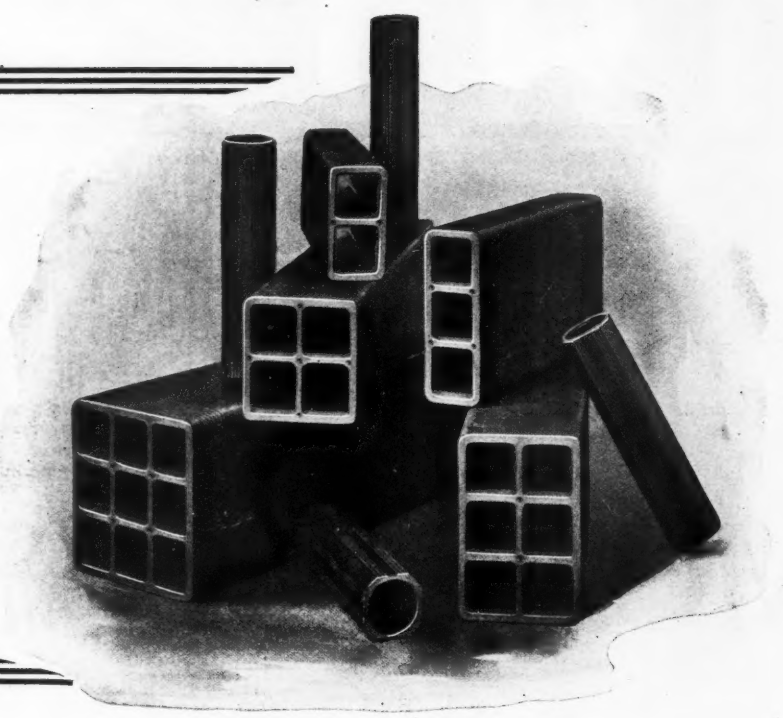
has assumed its superiority by evolution during a long period of experimentation and service. One difficulty after another has been met and overcome and imperfections developed in service have been removed, until now our claim is made without qualification that "Camp Duct" is recognized as the longest lasting of all conduits.

SINGLE AND MULTIPLE VITRIFIED CLAY CONDUITS

H. B. CAMP CO.

Fulton Building, Pittsburg
Flatiron Building, New York
Hartford Building, Chicago

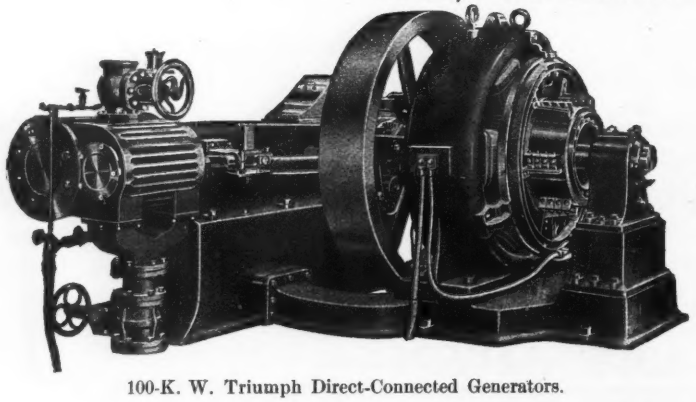
1



TRIUMPH

GENERATORS AND MOTORS

"Always the Standard of Excellence"



100-K. W. Triumph Direct-Connected Generators.

Built to give maximum output without undue strain on any part. Adapted to any kind of service. Unexcelled for efficiency, economy, and durability.

Our machines embody all modern improvements, and only the best of material and workmanship enter into their construction.

Our engineering department is at your disposal, to advise you as to the kind of apparatus best suited to your case.

Bulletins "ER 221 and 241" sent on request.

Triumph Electric Company

Main Office and Works: Cincinnati, Ohio, U. S. A.

BRANCH OFFICES

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Boston, 129 Pearl St.
Detroit, 194 Randolph St.
Atlanta, 40 North Broad St.
San Francisco, 17 Fremont St.
Rochester, 14 N. Water St.
Chicago, Great Northern Bldg.
Baltimore, 411 Courtland St.
Dallas, Tex., 225 Elm St.
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Birmingham, 227 Woodward Bldg.
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We design and
carry out in their entirety
ELECTRICAL
CONDUIT SYSTEMS
in every part of the
WORLD
G. M. GEST, Expert Electrical Conduit Contractor
Cincinnati, OHIO
277 Broadway, N. Y.

STANDARD VITRIFIED CONDUIT COMPANY

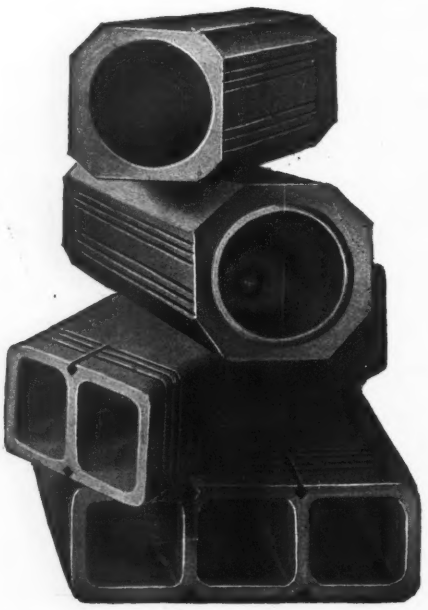
B. S. BARNARD, President

Main Offices: 39-41 CORTLANDT ST., New York, N. Y.

Manufacturers of

Multiple Duct Vitrified Conduits

Our Factories are the Largest in the World **Annual Capacity, 40,000,000 feet of Conduit**



SINGLE DUCT

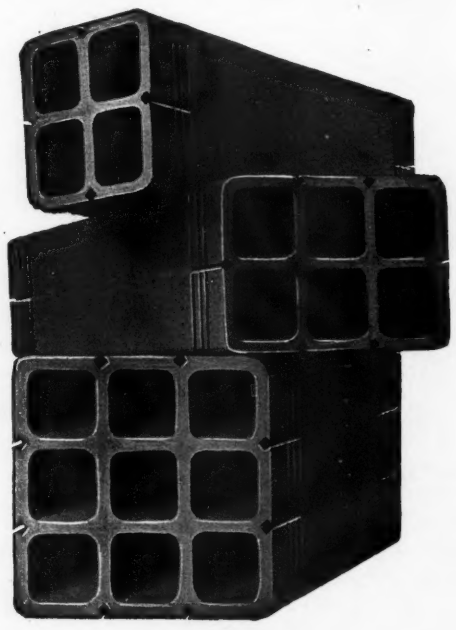
3¼ inch Round Bore
3½ " " "
4 " " "
3½ " Square "
3¼ " Round "
(Socket Joint)

MULTIPLE DUCT

2, 3, 4, 6 and 9 Duct
3¼ inch Square Bore
3½ " " "

MULTIPLE DUCT

2, 3, 4 or 6 Duct
3¼ inch Round Bore



OUR STANDARD MANDREL SUPPLIED FREE TO OUR CUSTOMERS

A few of the Big Contracts placed with us:

New York Edison Co.
Brooklyn Edison Co.
Philadelphia Electric Co.
Norfolk Railway and Light Co.
Montreal Light, Heat and Power Co.
Bell Telephone Co., U. S. A.
Bell Telephone Co., Canada
Pennsylvania R. R. Tunnel, N. Y. City
Trolley Tunnels, N. Y. City
Rapid Transit Subway, N. Y. City
Niagara Falls Power Co.
Dayton Citizens' Electric Co., Dayton, Ohio
Stromberg-Carlson Telephone Mfg. Co.
Charles E. Phelps, Jr., Engr., Baltimore, Md.

"CIRCULAR LOOM"

It's the Ideal Flexible Conduit for Interior Wiring

"CIRCULAR LOOM" is manufactured by the oldest firm in the world making conduit, and has the experience and skilled workmen and best material obtainable, all of which goes to make the best interior conduit "CIRCULAR LOOM."

"ELECTRODUCT"

Is the original enameled steel conduit and is still the best of its kind made. THE ENAMEL, our own product, is guaranteed not to chip or crack even when the conduit is bent to curves of short radius.

ELECTRODUCT COMPOUND

with which ELECTRODUCT is enameled, is both tough and elastic and is not affected by the greatest extremes of temperature.

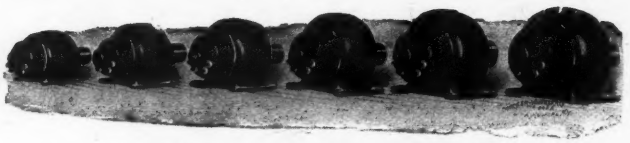
We can convince the most skeptical of its worth.

AMERICAN CIRCULAR LOOM CO.

CHELSEA, MASS., U. S. A.

NEW YORK—R. B. Corey, 39 Cortlandt Street
SAN FRANCISCO—John R. Cole Co., 766 Folsom Street
CHICAGO—Thomas G. Grier, 128 W. Jackson Boulevard

It Is Perfectly Safe to Recommend C-W Motors



The Celebrated Form L Motor 1-10 to 5 H.P.

The Central Station Manager who recommends **C-W** motors can rest easy.

It is hard even for a novice to put a **C-W** motor out of business.

C-W motors have a pleasing habit of doing more than is expected of them. Some of the reasons for this are given in Bulletin 64K.

C-W generators are described in Bulletin 74K and 80K.

CROCKER-WHEELER COMPANY

ALTERNATING AND DIRECT CURRENT MACHINERY

AMPERE, N. J.

What they say about the New York Automatic Motor Controller

HORNTHAL & COMPANY,
FINE FUNERAL FURNISHINGS,
329 TO 341 EAST 53D ST.

NEW YORK, July 28th, 1906.

NEW YORK ELECTRIC CONTROLLER CO.,
21 to 27 New Chambers St., N. Y.

GENTLEMEN:—In reply to your inquiry of recent date, we have derived so much satisfaction from the use of the automatic electric controller on elevator, and also the auto-charging board, both installed by you in January, 1906, that we wish to express our appreciation of their excellent operation. We have had no trouble, and are well pleased with everything.

If you wish to send any one to see the apparatus, will gladly show same.

Yours very truly,

(S) HORNTHAL & COMPANY, per Hatch.

Sundh Electric Co.

114 Cedar St., New York

Automatic Controllers

FOR

Alternating Current

and

Direct Current

CUTLER-HAMMER

A FEW FACTS BY WAY OF PREFACE

THE plant of THE CUTLER-HAMMER MANUFACTURING COMPANY, at Milwaukee, is the largest factory in the world devoted exclusively to the manufacture of ELECTRIC CONTROLLING DEVICES. The works occupy an entire city block and overflow into a five-story building across the way, recently purchased to provide the additional space demanded by our growing business. In addition to the Milwaukee plant this company operates a second factory in New York City and maintains District Offices in New York, Boston, Pittsburg and Chicago.

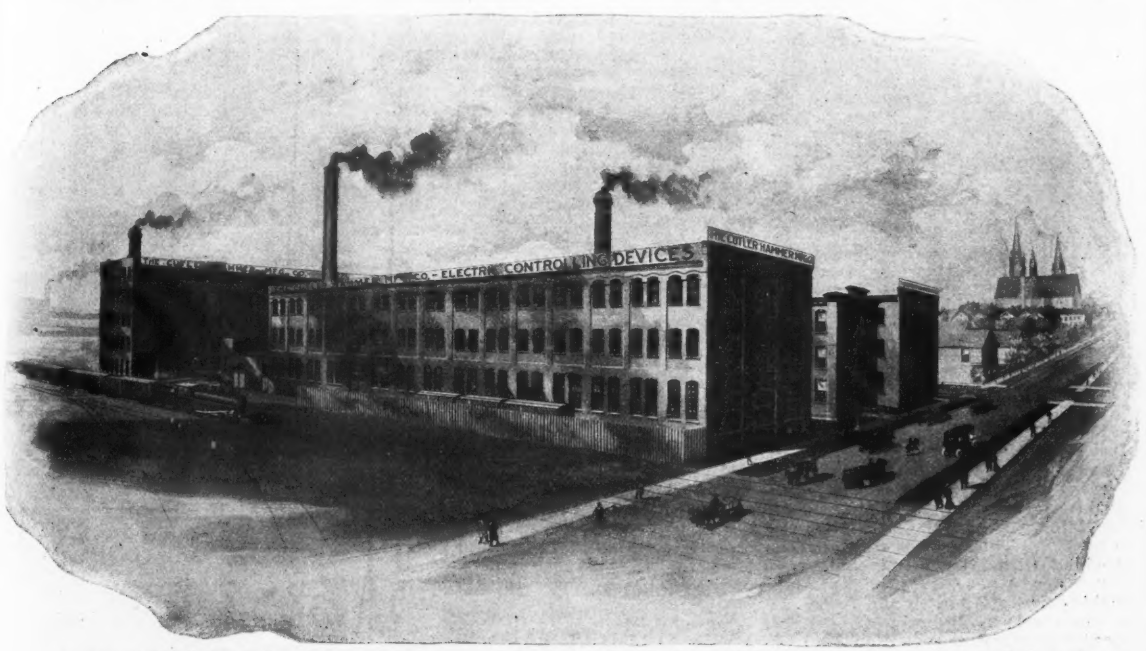
THE business of this company is the design and manufacture of ELECTRIC CONTROLLING DEVICES. We do not make motors, nor generators, nor any appliances for electric heating or lighting (except Theater Dimmers), but we do make every conceivable device for CONTROLLING the electric current. For sixteen years we have devoted all our energies to this one branch of the electrical industry. The knowledge gained during this period in solving all manner of problems involving ELECTRIC CONTROL is freely at the disposal of our customers.

WE INVITE inquiries from all who use generators or electric motors for any purpose. The performance of the motor depends to a great extent on the controlling device that governs it. CUTLER-HAMMER CONTROL is adapted to all types and sizes of motors, and though sometimes higher in price than competing apparatus, is nevertheless used to a far greater extent than any other. You can verify the truth of this assertion by noting the controlling device most frequently met with in electrical installations in your own locality.

WE INVITE correspondence, also, from those who have difficult problems to solve involving applications of ELECTRIC CONTROL. We are daily in receipt of letters asking how best to accomplish this or that result. Nearly always the problem, though new to the writer, is an old one to us, and we are frequently able to send blue-prints showing how the same conditions were successfully met in former cases. Central Station Managers, Makers of Motor-Driven Machinery, Consulting Engineers, Electrical Contractors and the Man on the Switchboard are cordially invited to avail themselves of our facilities. Tell us what you want to do and we will show you how to do it.

THE CUTLER-HAMMER MFG. CO., MILWAUKEE, WISCONSIN

NEW YORK OFFICE	CHICAGO OFFICE	PITTSBURG OFFICE	BOSTON OFFICE
136 Liberty St.	Monadnock Block	Farmers Bank Bldg.	176 Federal St.



A corps of skilled electrical engineers and draftsmen and the largest plant in the world devoted exclusively to the manufacture of ELECTRIC CONTROLLING DEVICES are at your service. Put your problems up to us.

BULLETIN 10
TELLS ABOUT MOTOR STARTING RHEOSTATS with no-voltage release.

BULLETIN 10 1/2
TELLS ABOUT multiple switch STARTING RHEOSTATS for large motors.

BULLETIN 13
TELLS ABOUT MOISTURE PROOF RESISTANCE motor starters. Ideal for damp locations.

BULLETIN 21
TELLS ABOUT UNIVERSAL MOTOR STARTER with all protective devices, knife switch and fuses.

BULLETIN 24
TELLS ABOUT starting and REGULATING RHEOSTATS as does also Bulletin 25.

BULLETIN 32
TELLS ABOUT FIELD REGULATORS for front and rear of switchboard.

CUTLER-HAMMER

BULLETIN 33

34 and 35 TELL ABOUT SELF STARTERS for alternating current motors.

BULLETIN 40

TELLS ABOUT SPEED REGULATORS as do also Bulletins 41, 42, 43, 44, 45 and 61½

BULLETIN 49

TELLS ABOUT ORGAN REGULATORS complete with chain and weight.

BULLETIN 51

TELLS ABOUT ELEVATOR CONTROLLERS as do also Bulletins 52, 53, 54, 56, 57 and 72-B.

BULLETIN 59

TELLS ABOUT radial arm reversible CONTROLLERS for CRANES and HOISTS.

BULLETIN 66

TELLS ABOUT reversible DRUM CONTROLLERS for CRANES and HOISTS.

We give below the gist of a number of inquiries culled from our daily mail together with an indication of the type of apparatus best adapted to meet the requirements of each particular case. Readers may perhaps find here information that will be helpful to themselves.

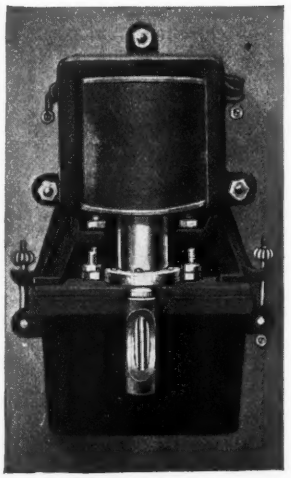
THE PROBLEM: An electrical contractor writes that he has a customer who wishes to procure an automatic pump controller for starting and stopping a 7½-H.P., 3-phase, 200-volt motor, used for driving a deep-well pump. The water is to be pumped into an air-tight steel tank, and he wishes the motor to be automatically started when the pressure falls below a certain point, and stopped when the pressure rises to a predetermined maximum.

THE SOLUTION: This case calls for a Cutler-Hammer alternating-current Self-Starter, to be used in connection with our gauge type Pressure Regulator. If instead of a closed tank an open tank were to be used, then the proper automatic control would be a Cutler-Hammer Self-Starter operated by a Float Switch.

NOTE: The subject of automatic-pump control is covered by Cutler-Hammer Bulletins Nos. 33, 34, 35, 70, 71, 71-C, 73 and 73-B. Bulletins 33, 34 and 35 describe and illustrate self-starters designed for use with alternating-current motors—single, two or three-phase; squirrel-cage and slip-ring type. Bulletins 70, 73 and 73-B describe Self-Starters for direct-current motors, while Bulletin 71 illustrates the float-switch and gauge-type pressure regulator used in connection with both alternating and direct-current equipments.

THE PROBLEM: A firm of consulting engineers asks for information concerning the best type of controller to use on two 20-H.P. and two 10-H.P. motors operating ventilating fans in an office building. The current available is D. C., 120 volts. The 20-H.P. motors are to be belted to the fans and will be run at 690 R.P.M. One of the 10-H.P. motors will run at 1,250 R.P.M., and the other, connected direct to a fan, at 200 R.P.M. It is desired that the controlling apparatus shall be capable of reducing the speed of each fan 50 per cent; also that the controllers shall be installed in the basement, although two of the motors are to be installed in another part of the building.

THE SOLUTION: Any one of several Cutler-Hammer Motor Speed Regulators will answer in this case. Probably the best, all things considered, would be the Universal Motor Speed Regulator, standard in sizes from ¼ to 50 H.P. This type of controller is provided with all protective features—underload and overload release, double-pole knife switch and fuses. It is described in Bulletin 42. Other speed-regulators suitable for controlling motors driving ventilating fans are described in Bulletins 40, 41, 44, 44½ and 45.



Self-Starter for alternating-current motors (Bulletin 33)

THE PROBLEM: An electrical contractor wants to know what type of controller is best adapted for use with a 3-H.P., 500-volt, direct-current, shunt-wound motor to be used for operating a 10-gallon ice-cream freezer. The maximum speed of the motor is 1,800 R.P.M. and the low speed about 1,000 R.P.M. It is desired to run the motor at the low speed until the cream begins to freeze, when speed will be increased to the maximum until the freezing is completed.

THE SOLUTION: The Cutler-Hammer Motor Speed-Regulator described in Bulletin 40 will answer perfectly in this case.

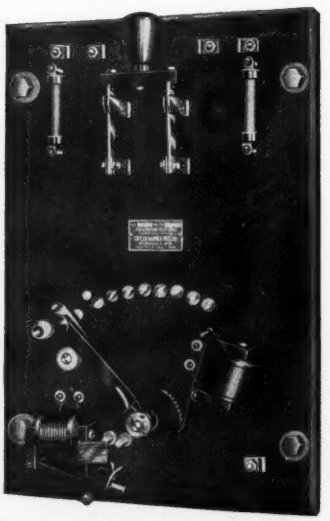
THE PROBLEM: From an electrical engineer in the far West comes this inquiry: "We are in need of an attachment for breaking the circuit on an A.C., 7½-H.P., 220-volt, 2-phase, squirrel-cage-type motor. This is a small motor that we run in a place where there is no one to watch it, and as the power-house frequently cuts off the current we want a device to break the circuit so as to protect the motor from injury when the power comes on again. Can you furnish such a device?"

THE SOLUTION: A Cutler-Hammer Self-Starter (Bulletin 34) will exactly fulfil the conditions stated above. This type of Self-Starter is designed for use with squirrel-cage-type motors. In similar cases, where a slip-ring-type motor is used Bulletin 35 Self-Starter should be specified.

THE PROBLEM: In a foundry a two-ton overhead traveling crane is in use, being pulled along the run-way by hand. It is proposed to equip the crane with a motor to drive it back and forth along the run-way, and a controller is desired which can be conveniently operated from the floor by means of a rope. It is considered essential that the controller be so arranged that as long as the operator has hold of the rope the motor will continue to drive the crane, but the moment the rope is released the motor must stop; otherwise it is anticipated that damage may some day result through the operator forgetting to shut off the current.

THE SOLUTION: The Cutler-Hammer Radial Arm Crane Controller, rope-operated type, will exactly fulfil the conditions stated in this case. It is designed to be operated from the ground by means of a rope, and the moment the pull on the rope ceases a strong centering spring throws the operating lever to the "off" position.

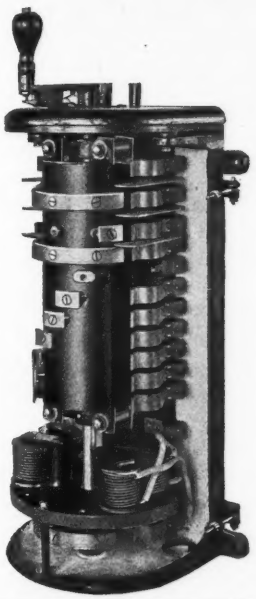
NOTE: Cutler-Hammer Controllers for Cranes and Hoists are described in Bulletins 59, 66, 66-A and 69. Bulletin 59 describes Radial Arm Reversible Controllers for bridge, hoist and trolley duty. This type of controller is made in various forms.



Motor Speed-Regulator, Universal type. (Bulletin 42)

What we want YOU to do is, to tell us what you WANT to do. We'll show you HOW to do it.

CUTLER-HAMMER

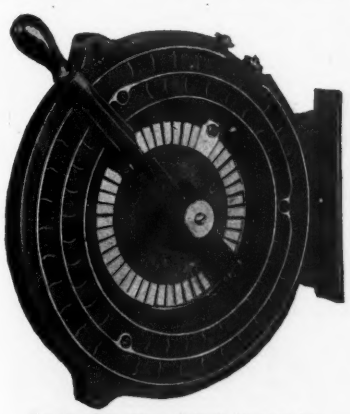


Slow-speed, reversible, drum controller, for cranes, hoists, etc. (Bulletin 66A)

one of which is the rope-operated type. Another form of rope-operated controller is described in Bulletin 69. Bulletins 66 and 66-A describe reversible drum controllers for crane and hoist duty. The latter is known as the "slow-speed" controller and is especially adapted for foundry work where it is necessary to lift patterns from the sand gently and without jerking. Cutler-Hammer controllers intended for foundry and steel-mill work are of unusually rugged construction and all parts subject to wear are renewable.

THE PROBLEM: An electrical supply house has a customer—a tailor—who wants a small rheostat to use in connection with several electric irons, on a 110-volt, D.-C. circuit. He wants some device that will care for one, two or three irons, each taking about 6 amperes of current.

THE SOLUTION: For the purpose set forth above a Cutler-Hammer single-plate dimmer answers admirably. Probably the best type to use in this case would be Dimmer No. 24118 listed in Bulletin 92A-2. This dimmer has a total resistance of 15 ohms, with ampere capacity tapering from 20 down to 5 amperes. When used in connection with three irons on a 110-volt circuit, the resistance will be sufficient to reduce the current from 18 to approximately 5¼ amperes. When used with only two irons the resistance would be capable of reducing the current from 12 amperes down to about 4½ amperes, while with only one iron in circuit with the dimmer the resistance would be sufficient to reduce the current from 6 amperes to approximately 3 1-3 amperes.



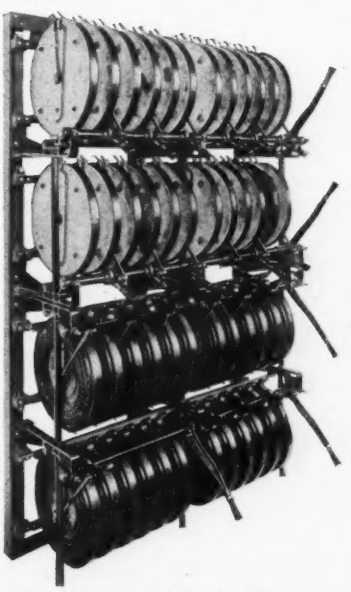
Single plate "Simplicity" dimmer for churches, lodge-rooms, etc.

NOTE: Cutler-Hammer Single-Plate Dimmers and Theater Dimmers are described in a handsomely illustrated booklet which may be had free on request. The theater dimmers—known as "Simplicity" type—are used by nearly every leading theater in New York City, Chicago and other important theatrical centers. We furnish them in any size from a single plate, capable of dimming fifty sixteen-candle-power lamps, up to (or beyond) an equipment similar to that furnished the Knickerbocker Theater, New York City, which has a capacity of 2,400 lamps. Our single-plate dimmers are much used in churches and lodges, where positive control of the lights is desired to augment the impressiveness of religious and masonic ceremonies.

THE PROBLEM: A firm of electrical contractors advises us that they have an inquiry from a customer who wants "a very peculiar arrangement for a motor." He wants to install a 3-H.P., 220-volt, direct-current motor, belted to an exhaust fan. This fan exhausts from six vents, and he wants to arrange a switch on the door of each vent so that whenever one of the doors is opened the fan will start up. It is also specified that the controlling device shall be so arranged that the fan shall operate at its minimum speed when only one vent is open, but shall automatically increase its speed as the other five doors are opened.

THE SOLUTION: A Cutler-Hammer Self-Starter (Bulletin 73-B) and six double-pole Float Switches (Bulletin 73)—one for each door—constitute an equipment that will meet every requirement of this case. The tumbler arm of the float switches should be mechanically connected to the doors by suitable chains and weights. One pole of each float switch would be arranged to control a circuit to the main solenoid switch of the Bulletin 73-B Self-Starter, while the other pole would be connected so as to cut out a section of resistance from the motor circuit. With this equipment the opening of one vent would energize the self-starter and at the same time one section of the resistance would be cut out of the motor circuit, allowing the motor to start with five sections of resistance in circuit, which would reduce the speed to 40 per cent below normal. If a second vent is now opened another section of resistance will be cut out, allowing the motor to operate at a somewhat higher speed, and when all six doors are open at the same time all resistance will be cut out of the armature circuit and the motor will be driving the fan at maximum speed.

The English alphabet contains only 26 letters, but by using these in various combinations it is possible to spell any of the 300,000 words listed in the Century Dictionary. Our complete catalog contains descriptions of more than 2500 types and sizes of STANDARD CUTLER-HAMMER APPARATUS, and by combining these in various ways *we* are able to spell the solution of any problem involving ELECTRIC CONTROL.



Bank of "Simplicity" Theater Dimmers

THE CUTLER-HAMMER MFG. CO.

MILWAUKEE, WISCONSIN

NEW YORK OFFICE 136 Liberty St. | CHICAGO OFFICE Monadnock Bldg. | PITTSBURG OFFICE Farmers Bank Bldg. | BOSTON OFFICE 176 Federal St.

BULLETIN 70-A
TELLS ABOUT Cutler-Hammer SELF STARTERS for electric elevators

BULLETIN 71
TELLS ABOUT FLOAT SWITCHES and PRESSURE REGULATORS.

BULLETIN 73
TELLS ABOUT controlling devices for small MOTOR-DRIVEN PUMPS.

BULLETIN 75
TELLS ABOUT MACHINE TOOL CONTROLLERS as do also Bulletins 76, 77, 78 and 79.

BULLETIN 81
and a dozen other Bulletins TELL ABOUT PRINTING PRESS CONTROLLERS.

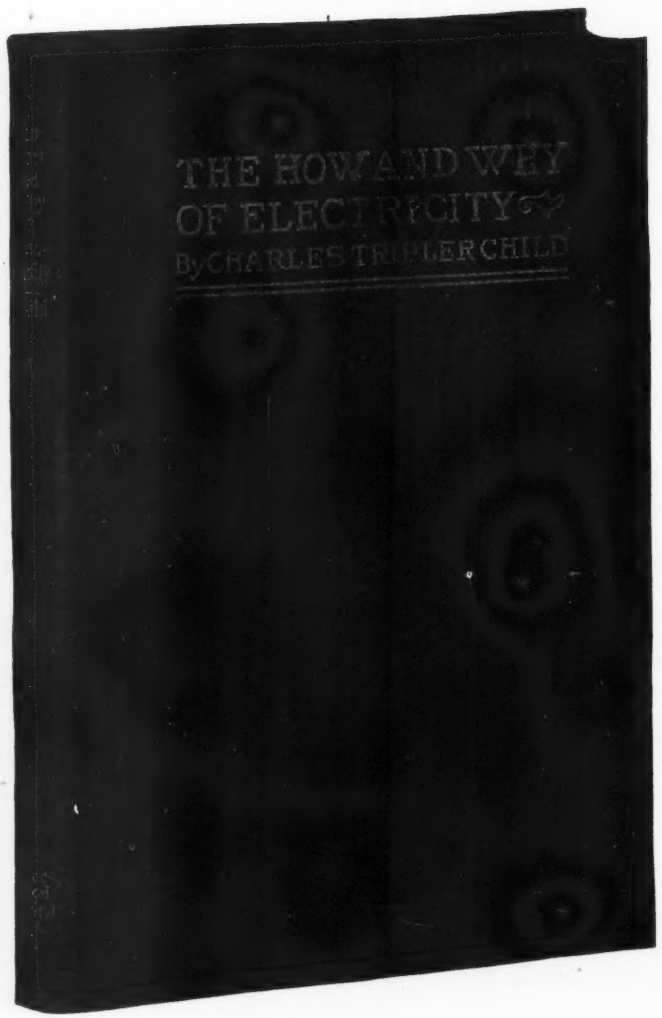
BULLETIN 92
TELLS ABOUT THEATER DIMMERS "Simplicity" type. Used by leading theaters everywhere.

Second Edition, Revised and Enlarged Price $1.00, Postage Prepaid

"The How and Why of Electricity"

By Charles Tripler Child

Late Technical Editor of the ELECTRICAL REVIEW



WHILE the added matter has brought the volume up to date in every phase of this study, the original text, as prepared by its brilliant author, remains to entrance the reader. New illustrations have been made where it was deemed possible to further illuminate the explanatory matter. The book contains no mathematics. The phenomena of electricity are treated in splendidly arranged word pictures, and the engineer, the student and the non-technical reader, alike, may be benefited and entertained by this book.

CONTENTS

CHAPTER	
	Preface
I	The Electric Current
II	The Electric Battery
III	The Effects of Electric Flow in the Circuit—Heat and Chemical Action
IV	The Effects of Electric Flow Outside the Circuit—Magnetism and Induction—The Electrical Units
V	Electromagnets—The Telegraph
VI	Electric Signaling Apparatus
VII	The Relations Between Magnets and Electric Currents
VIII	Induction and Reactive Coils
IX	The Telephone
X	Telephone Accessories
XI	The Mechanical Generation of Electricity
XII	The Dynamo Machine
XIII	Various Types of Dynamo Machines
XIV	Alternators—Polyphase Currents
XV	The Electric Motor
XVI	The Electric Railway
XVII	Polyphase Currents and Motors
XVIII	Electrical Power Transmission
XIX	The Incandescent Light
XX	The Arc Light
XXI	Electrochemistry—Storage Batteries
XXII	Wireless Telegraphy
XXIII	Radiation—X-Rays
XXIV	Recent Theories

"The descriptions are helped out with cuts and diagrams that really explain. We know nothing that gives so much help on a difficult and complex matter in so short a space."—*New York Sun.*

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THEY "MAKE GOOD" WHEN ALL OTHER MAKES FAIL

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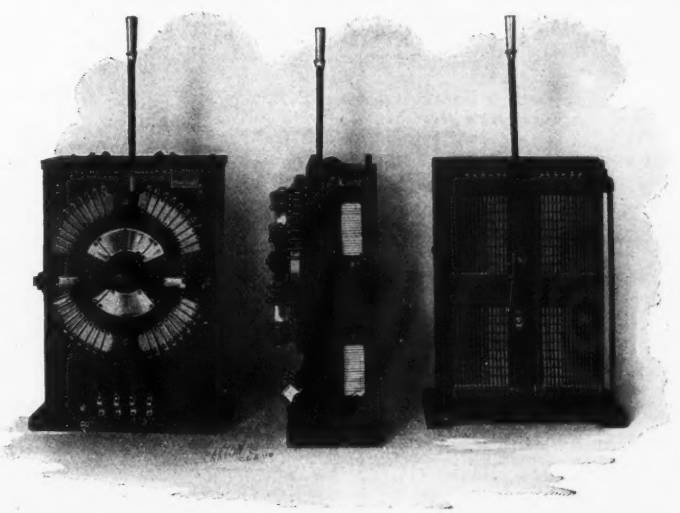

Their rugged construction enables them to withstand heavy overloads.

All contact segments are made of pure copper and are screwed to brass lugs. These screws are round head and so placed that the fingers pass between them, thus preventing welding from arcing and permits the easy removal or reversal of the segments.

Resistance fillings are made up in banks which are removable from the controller in a complete unit.

Separate grids or coils are easily removed from these units without disassembling.

Positive connection insured between grids by the use of copper jumpers fastened to each grid by two screws.

All parts are interchangeable and all contacts are reversible.

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The Dinkey Ventilated Controller stands to-day the acknowledged standard for the control of motors under severe and exacting conditions.

The facts that it is operating successfully in the majority of large iron and steel works the world over; that a number of prominent crane manufacturers have adopted it as a standard to the exclusion of all other makes of controllers; and that many satisfied purchasers specify it for the control of all cranes and motors installed in their plants, are ample proofs of superiority.

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A meter without a commutator. Driving system floated; no weight on lower bearing. Shunts used on large sizes, which simplifies and cheapens wiring up. Shipped complete ready to install, not a screw or a nut to touch after erection. Stands electrical and mechanical abuse that would wreck any ordinary meter. Workmanship second to none in the world. Light load and overload accuracy unequalled. No inflammable or hygroscopic parts. Lowest depreciation known. Small, neat and simple. If injured, can be repaired with utmost ease and rapidity. Quality considered, the lowest in price. : : :

Perusal of the bulletin, which will be sent on request, will disclose other virtues.

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METER TALK

No. 15

AFRICA is the most ancient and the most recent conquest of the human race; and David Livingstone did more than any other explorer of modern times in the way of bringing it to the notice of the world, and placing it within the sphere of advancing civilization.

This great man—after spending the best part of his life in traveling over 20,000 miles of jungle, stream and lake—prophesied "that the next generation would see much of this dark continent brought into touch with the rest of the world;" and as proof of the fulfillment of this prophecy, there are, to-day, numerous prospering towns, each having its electric lighting plant with DUNCAN METERS accurately measuring the energy delivered to its patrons.

SEND FOR BULLETIN, TESTING CHART, AND DISCOUNTS

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VICTOR INSULATORS

No. 409—Insulator.
Diameter 9 inches.
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Line Voltage 30,000 volts.
This Insulator is of two parts, cemented together. (2)

THE LOCKE INSULATOR MFG. CO.
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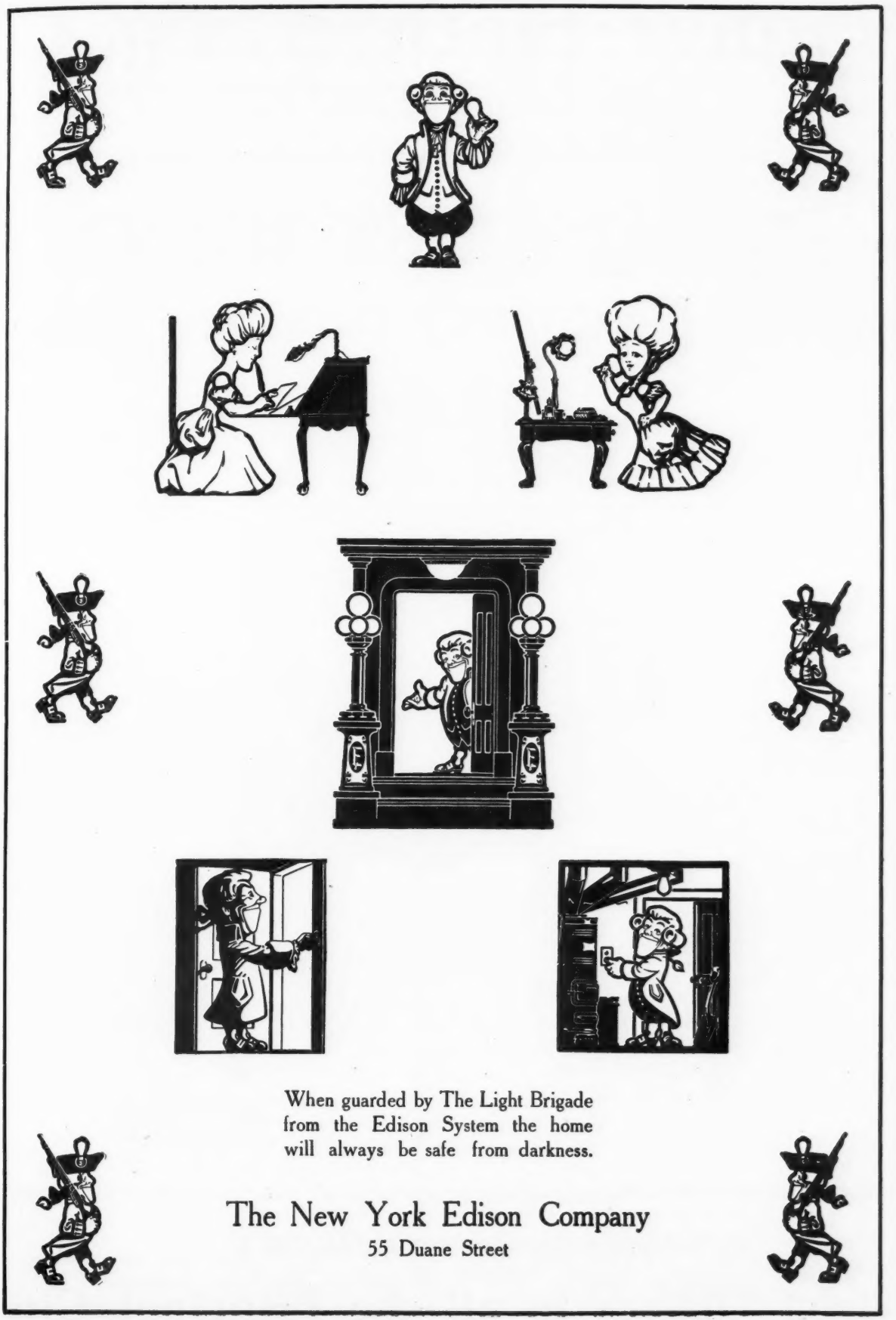

When guarded by The Light Brigade
from the Edison System the home
will always be safe from darkness.

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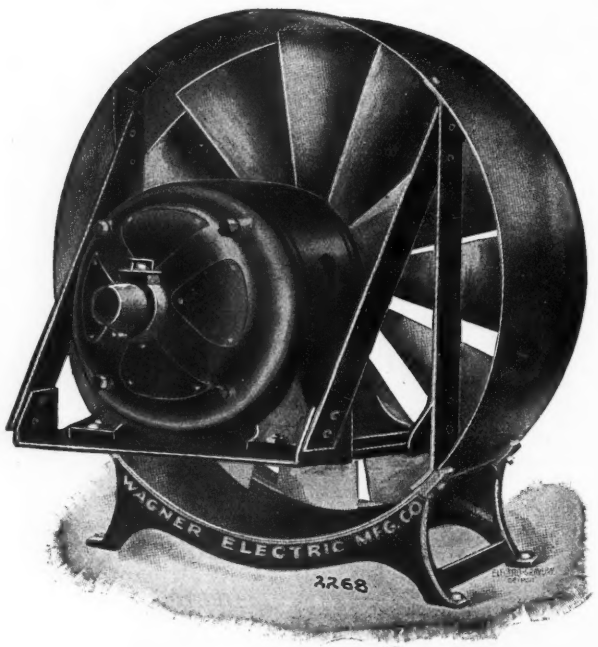
THE DAY CIRCUIT BUILDER

SINGLE PHASE VARIABLE SPEED VENTILATING FAN OUTFITS



SIZE OF FAN, SPEEDS

Size Fan	Maximum Speed	Minimum Speed	No. of Steps, Speed, Variation
18	1165	480	10
24	1165	480	10
30	850	340	10
36	700	280	10
	550	220	
42	500	200	10

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are now regarded as necessities in the operation of numerous small mechanisms. The electric motor now operates almost any device that revolves on a center or axis. Fort Wayne small motors are being successfully adapted to many mechanical devices such as letter sealers, sewing machines, massaging outfits, vibrators, copying machines, hand drills, hair drying outfits, etc. Fort Wayne motors not only operate such mechanisms easier and cheaper but more satisfactorily than in any other way.

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Have you seen these Motors?

The illustrations herewith show a standard frame small power motor with three step grooved pulley and a standard frame motor equipped to operate a small hand drill.

Type GD Motor Operating Hand Drill—For Direct Current Only

Fort Wayne Standard small power motors are made in two types, for alternating and direct current, in sizes from 1/100 to 1/30 H. P. Our Bulletin 1093 shows many other applications and explains details.

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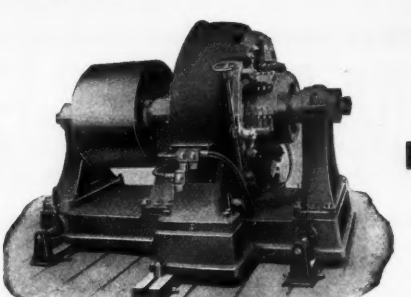
Belt-Driven D. C. Generator



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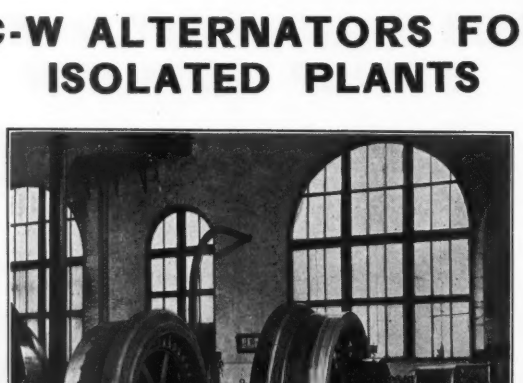
C-W ALTERNATORS FOR ISOLATED PLANTS



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We are not alone in believing that we are ahead of the market in A. C. design. Send for Bulletins Nos. 74 K and 77 K, "Alternating Current Generators."

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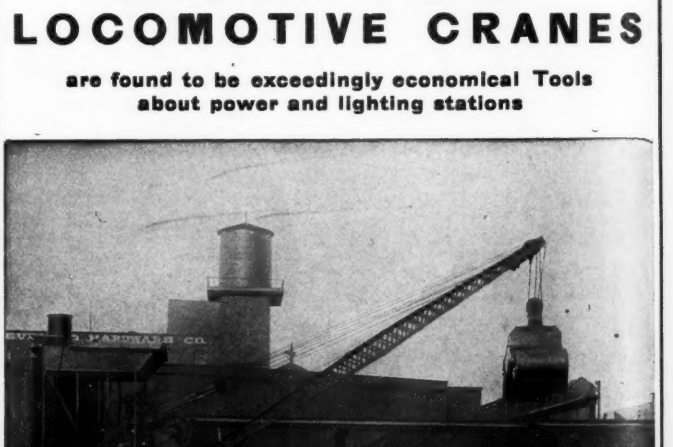

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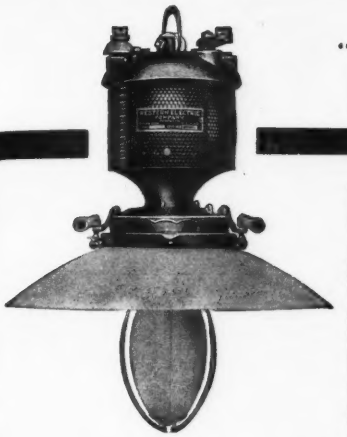

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You buy lamps to last and give service—YOU WANT RESULTS. The "Hawthorne" is a "satisfier," a long-burning and perfectly designed lamp.

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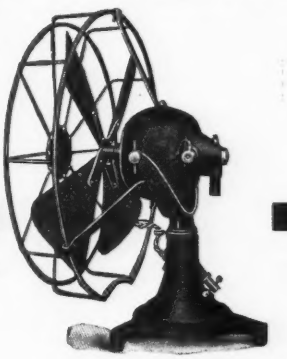

W. E.
"Universal"
D. C.
Desk Fan

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COOL RUNNING GENERATORS BREED

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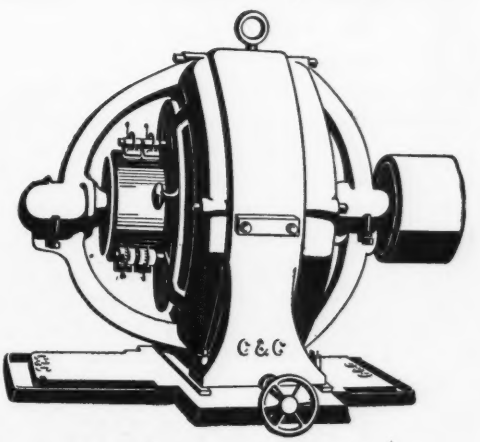
COOL CUSTOMERS



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are economical and always reliable.

C&C COMMUTATORS
run cooler than all others, in fact cooler than any part of our machines.

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BULLETIN 154 TELLS WHY

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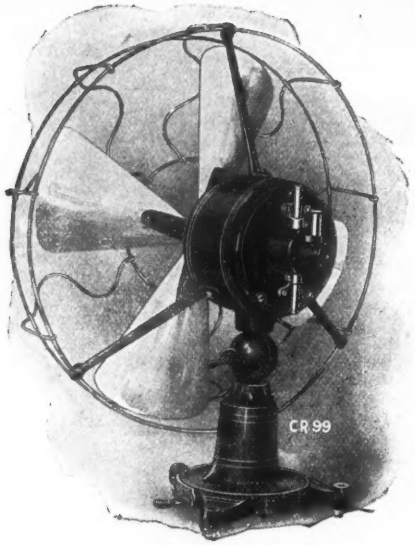

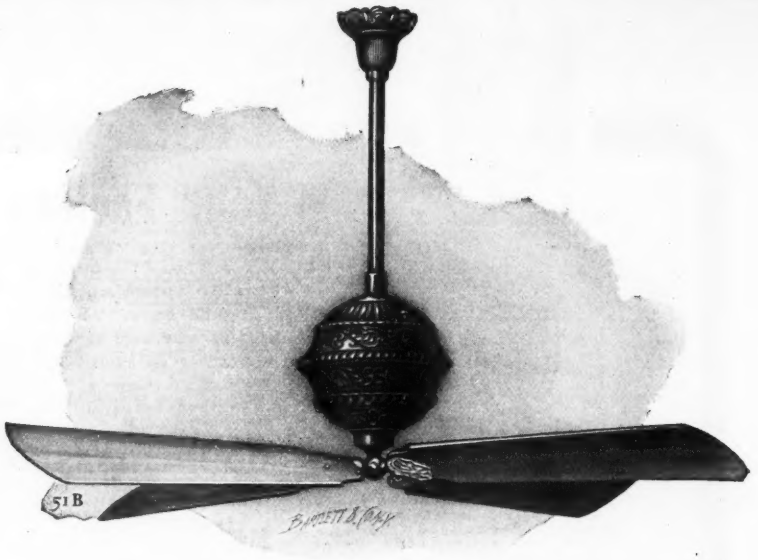

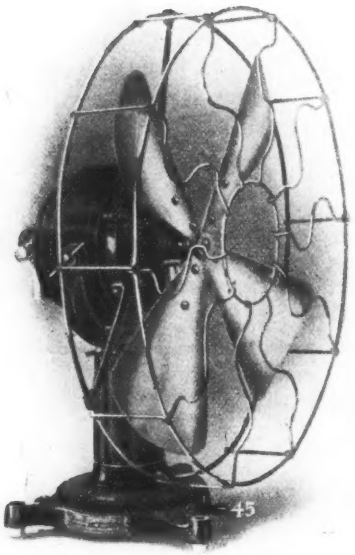

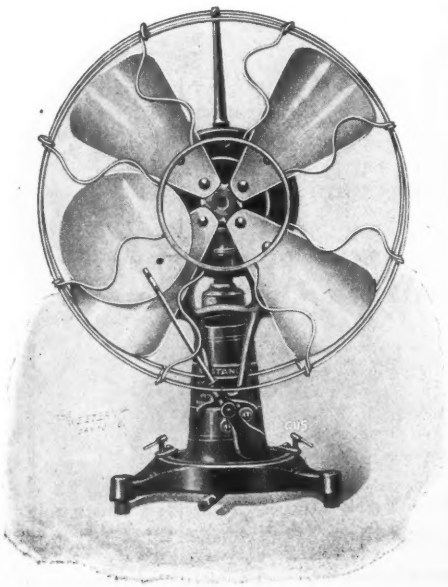

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The ROBBINS & MYERS ORGANIZATION is composed of the most expert workmen in the trade. Men who have not only spent years studying the wants of particular buyers, but who have been familiar for many years with the largest fan interests in the country; familiar with and suggesting the progressive ideas for fan improvement.

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The Results are not only tangible and easily seen, but most decisive.

"The Standard" Fan is the evidence, the tremendous sale throughout the world tells the public verdict based on the evidence, but we are not contented with their verdict alone, **we want yours.**

We are not satisfied with the past reputation, we want to build a still greater one.

"The Standard" is built right and stays right. The line comprises a complete selection of different types of ceiling, desk, bracket, oscillating desk, and small exhaust fans for direct-current circuits.

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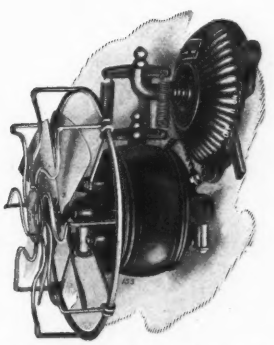
Diehl FANS

No. 46

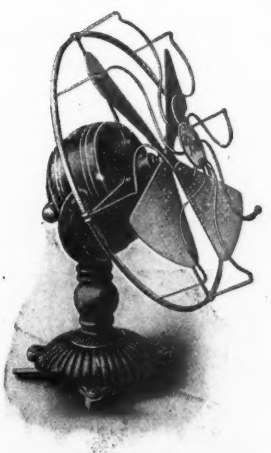
No. 36 Fan—Bracket

Any Finish



No. 139 Telephone Booth Fan

Any Voltage



No. 36 Fan—Desk

Ceiling Fans
Column Fans
Universal Desk Fans
Bracket Fans
Telephone Booth Fans
Exhaust Fans

No. 12

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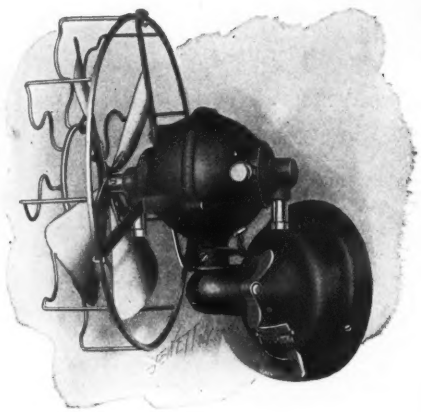
SPRAGUE ELECTRIC FANS

NEW DESIGNS FOR 1907



DEALERS will not have to carry in stock more than one type of fan, as the new model can be used either as a desk or bracket type without additional expense. This simplifies the stock problem.

USERS will find this fan more convenient because of its universal adaptation to requirements.

ALL the good features of the Lundell fans have been retained, and with the new improvements these famous fans are sure to be in great demand.

BE prepared for the warm weather when it comes.

ORDERS should be sent in early. Write for catalogue No. 3156.

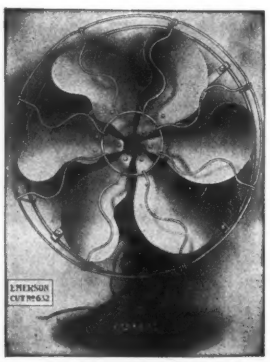
SPRAGUE ELECTRIC COMPANY

GENERAL OFFICES: 527-531 WEST 34th STREET, NEW YORK

Branch Offices in Principal Cities

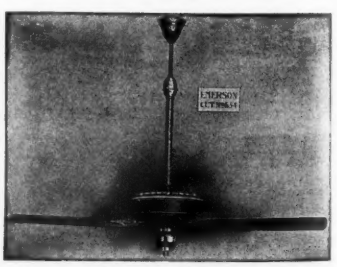
Emerson Residence Type Fans

For Alternating Current



Residence type desk fans are so designed as to be practically noiseless. Ideal for homes, hospitals, libraries, small offices. These fans throw sufficient air for all ordinary purposes, even at slow speed.

Emerson two-blade ceiling fans are also intended especially for residence use. The three-speed regulating switch allows reduction of the breeze to satisfy any user.



Residence Type Fans are only one feature of the Emerson line. We make powerful four-blade ceiling fans, and desk fans throwing strongest desired breezes. All types may be assorted in ordering.

The Emerson Electric Mfg. Co.

Eastern Office and Warehouse
136 Liberty Street, New York City

St. Louis, Mo.

"IT MIGHT INTEREST YOU

to know that the total maintenance expense of parts for our entire plant of 3000 switches for the past eighteen months has been $10.24," writes Supt. J. A. Duncan of the Sioux City Telephone Company, Sioux City, Iowa. (This company operates our ***Automatic Telephone System.***)

"***A like sum*** would perhaps take care of the repair cost on operators' chairs in a manual exchange of the same size," adds Mr. Duncan. (We'll be glad to send you a copy of his letter if you'd like to see it.)

It occurs to us that the one item of switchboard cords alone for a manual exchange of 3000 lines would amount to at least $150 in eighteen months. That is fifteen times the cost of all repair parts on the Sioux City automatic exchange.

That is Only One of the many economies of the ***Automatic System.*** These economies all help to swell the profits. And the ***Automatic,*** being the best service, commands the highest rates. Low production cost plus high selling price equals big dividends. That is what led to the adoption of the ***Automatic Telephone System*** in the following cities:

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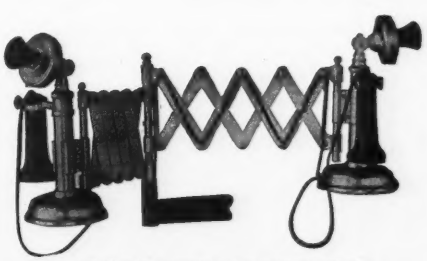

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Burns' Adjustable Desk Telephone Bracket

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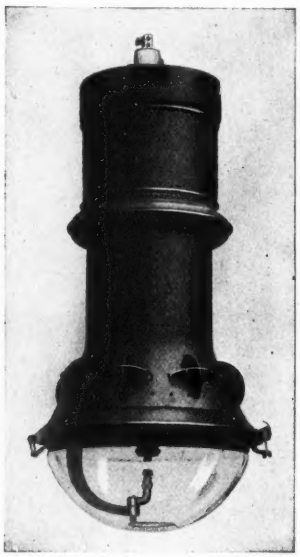
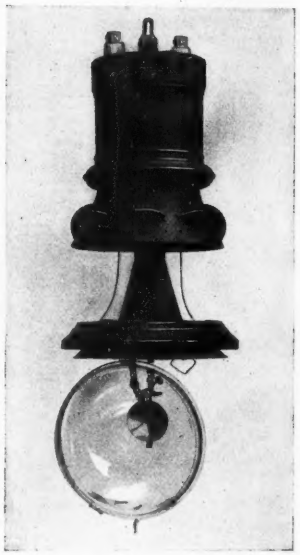
For Street Lighting





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Upper element being the metallic substance which consumes in service, the life per trim is only limited by the length of the lamp.

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In placing this new line of apparatus before the public, it is with the assurance that it has been thoroughly tested and tried out under actual service conditions, and that, as regards simplicity and efficiency, it represents the highest development of the art, possessing many features of value not heretofore attained.

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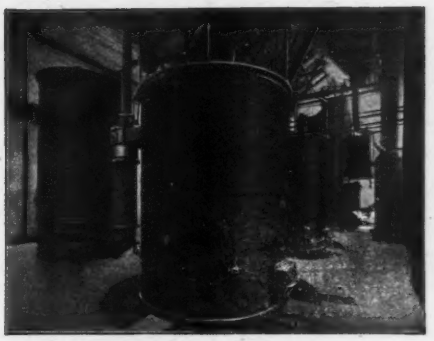

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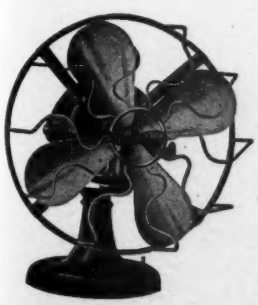
Are not a luxury, they are a necessity



A necessity to the Public

Which does not wish to suffer during the torrid weather.

A necessity to the Dealer

Who does not wish to suffer by ignoring public demand.

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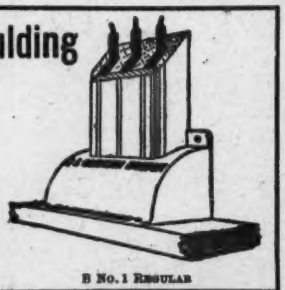

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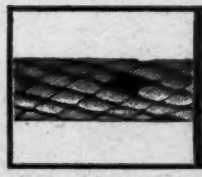

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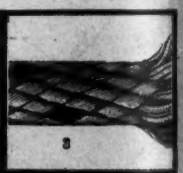

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